SYSTEMATIC PLANT STUDIES

ADVERTISEMENT

The United States National Herbarium, which was founded by the Smithsonian Institution, was transferred in the year 1868 to the Department of Agriculture and continued to be maintained by that department until July 1, 1896, when it was returned to the official custody of the Smithsonian Institution. The Department of Agriculture, however, continued to publish the series of botanical reports entitled "Contributions from the United States National Herbarium," which it had begun in the year 1890, until, on July 1, 1902, the National Museum, in pursuance of an act of Congress, assumed responsibility for the publication. The first seven volumes of the series were issued by the Department of Agriculture.

ALEXANDER WETMORE,
Assistant Secretary, Smithsonian Institution.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS

FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 26

SYSTEMATIC PLANT STUDIES: MAINLY TROPICAL AMERICAN

BARTRAM, BLAKE, CHRISTENSEN
KILLIP, MORTON, PITTIER, TRELEASE

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ERRATA

Page 145, line 4: For "no. 1,229,355" read "no. 1,229,366."

Page 164, line 41: For "51116" read "51166."

Page 181, line 14: For "no. 1,307,315" read "no. 1,307,317."

Page 206, lines 28–31: Statement regarding type should read: "Type in the U. S. National Herbarium, no. 1,251,287, collected at Finca Montecristo, on the Río Reventazón below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 49016)."

Page 206, lines 33 and 34: For "Finca Montecristo" read "Hamburg Finca," and for "49016" read "48932."

Page 295, lines 34 and 38: For "*lobata*" read "*lobatum.*"

Page 299, line 29: For "*Athyrium tenuifrons*" read "*Asplenium tenuifrons.*"

Page 316, line 38: For "f. *thunbergiana* (Kaulf.) Takeda, loc. cit." read "f. *contorta* (Christ) Takeda, op. cit. 270."

Page 415, line 27: For "*arguta*" read "*uncinata.*"

Page 503, lines 19 and 23: For "*Pilea antioquiensis*" read "*Pilea antioquensis.*"

vol.

PREFACE

Volume 26 of the Contributions consists of 10 parts. The first is a short paper By Dr. H. Pittier, of Caracas, Venezuela, giving an account of the Central American representatives of the Lecythidaceae, or brazilnut family. Many trees of this family produce edible seeds, such as brazilnuts and sapucaia-nuts, some of which are an important article of export from South America. The species are little known botanically since they are mostly large trees, growing in wet virgin forests difficult of access. From Central America Mr. Pittier reports 5 genera and 19 species, 11 of the species being described as new. Most of the known Central American species are confined to Panama.

The second part consists of a revision, by Dr. William Trelease, University of Illinois, of the Piperaceae, or pepper family, as represented in Panama. Dr. Trelease is engaged in a monographic study of the American Piperaceae and has undertaken a revision of all the Panama species in connection with identifying a large quantity of material obtained in the region of the Canal Zone. He lists 138 from Panama, these being referred to four genera, one of which is new.

Part 3 is an account, by Edwin B. Bartram, of a collection of mosses obtained in Costa Rica by Paul C. Standley, formerly associate curator of the National Herbarium. The collection was made during an investigation of the flowering plants in two visits to Costa Rica in the early part of 1924 and the winter of 1925–26. There are enumerated 272 species and varieties, of which more than one-third are new to Costa Rica. Many of them are South American species, not previously recorded from North America. In addition, Mr. Bartram described 42 new species and varieties and one new genus. The wet mountain forests of Central America are rich in mosses, especially in epiphytic forms, and there is every reason to expect that future exploration will yield a large number of species unknown at present.

Part 4 deals with the very numerous forms of Piperaceae occurring in Costa Rica. It has been prepared in connection with Dr. Trelease's monographic study of the family as represented in North and South America. It is based upon a wide examination of material in both European and American herbaria, including a very large series of specimens collected in Costa Rica by Paul C. Standley. In all, 434 species are recognized (2 in *Pothomorphe*, 2 in *Sarcorachis*, 290 in *Piper*, 140 in *Peperomia*), more than one-half being here described as new. The type specimens of nearly all the new species are in the National Herbarium.

Part 5, by Dr. S. F. Blake, of the Bureau of Plant Industry, United States Department of Agriculture, presents some of the results of his

examination of type specimens of Mexican and Central and South American Asteraceae preserved in several of the larger European herbaria. Although confirming our present understanding of a large number of species, this study of historical material, much of which had never been critically examined since the species concerned were described long ago, has resulted in changes in the interpretation of four generic and over a hundred specific names. It serves to emphasize the need for careful reexamination, in the light of modern knowledge, of the very numerous type specimens of American plants preserved in European collections and known to students in America only by the often meager original descriptions. Such specimens, on the correct identification of which the stability of our nomenclature largely depends, are frequently so fragmentary or otherwise imperfect that a photograph is not sufficient for recognition, and personal examination by a botanist thoroughly familiar with the group under investigation is required.

The sixth part, by Dr. Carl Christensen, of Copenhagen, is a report upon the ferns and fern allies collected by Joseph F. Rock in southeastern Asia from the middle of 1920 to March 1924, while engaged in botanical and ethnological field work. During the early part of this period Mr. Rock was employed as agricultural explorer for the Bureau of Plant Industry, United States Department of Agriculture, and gave special attention to an investigation of the sources of chaulmoogra oil, at that time a little-known specific for leprosy, among the forests of the Burma-Yunnan border region. The exploration was carried also far into the Province of Yunnan, southwestern China, and in February 1923 was taken over by the National Geographic Society and was conducted under the auspices of the society for more than a year, the herbarium specimens (nearly 80,000 in number) from both sources being turned over to the United States National Museum. The collections thus brought together are notable for their large representation of primroses, rhododendrons, and ferns, and the National Museum is fortunate in being able to present a critical analysis of the fern material by Dr. Christensen, a special student of the Asiatic species of this difficult group. All of Mr. Rock's pteridophytes from the regions mentioned, and of his smaller collections from Siam and Tibet, are cited in the present paper, with frequent reference to much historically important material collected by earlier explorers.

Part 7, entitled "The Mexican and Central American Species of Viburnum," by C. V. Morton, at present assistant curator in the National Herbarium, is the result of a critical study of material in the larger American herbaria and in the collections of the Botanisk Museum, Copenhagen, and the Royal Botanic Gardens, Kew. With the aid of data furnished by these historic specimens it has been possible to provide a fairly satisfactory treatment of the abundant

material collected in recent years, by making use largely of minute characters that have not previously received adequate attention. During the past 70 years only 5 species have been described from Mexico and Central America. In the present revision 30 species are recognized, 10 of which are described as new. In general, they are of rather narrowly limited distribution. None are known to be important economically.

Part 8, by Ellsworth P. Killip, associate curator in the National Herbarium, contains descriptions of numerous new species of *Pilea*, a genus of the family Urticaceae, which reaches its greatest development in the West Indies and western South America. As a member of three botanical expeditions to the Andes, Mr. Killip made extensive field observations and assembled a large series of specimens. These, with the rich collections in the more important herbaria of the United States and Europe, have served as the basis of a thorough revision of the genus as represented in the Andes. The results are partially presented in this paper, which consists of a key to all the species, 111 in number, and descriptions of 30 found to be new. In addition, three species are renamed, and two are raised from varietal to specific rank with change of name.

Part 9, by C. V. Morton, is a critical account of the species of *Besleria*, of the family Gesneriaceae. This genus is confined to the New World Tropics, ranging from southern Mexico to Bolivia and Brazil. The author recognizes 141 species, of which 43 are here first described. Included also are descriptions of 11 new varieties and 5 new forms. The relatively large number of novelties is due partly to the slight attention that has been given to the genus since the appearance of Professor Hanstein's monograph in 1865 and partly to the abundance of recent material now available for study, the present treatment being based upon specimens in the leading herbaria of the United States and in several of the larger botanical institutions of Europe. Types or isotypes of nearly all previously described species have been examined.

The tenth and concluding part, by Ellsworth P. Killip, entitled "The Andean Species of Pilea," is complementary to Part 8. With the exception of the 30 new species described in Part 8, it includes detailed descriptions of all the species there listed, together with synonymy, notes on relationships, geographic distribution, and citation of specimens examined. In addition, three species and a single variety are described as new. The number of species treated is 115. The area covered embraces Venezuela and adjacent Curaçao, Colombia, Ecuador, Peru, Bolivia, and Chile.

WILLIAM R. MAXON,
Curator, United States National Herbarium.

June 14, 1939.

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THE LECYTHIDACEAE OF CENTRAL AMERICA

By H. PITTIER

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PREFACE

The first part of volume 26 of the Contributions from the National Herbarium is devoted to an account of the Central American representatives of the Lecythidaceae or brazilnut family, by Mr. H. Pittier, of Caracas, Venezuela. Many trees of this family produce edible seeds, such as brazilnuts and sapucaia-nuts, some of which are an important article of export from South America. The species are little known botanically, since they are mostly large trees, growing in wet virgin forests difficult of access, and it is hard to procure specimens of them.

In continental America the family is known to range northward to Nicaragua. From Central America Mr. Pittier reports 5 genera and 19 species, 11 of the species being described as new. The greater number of the known Central American species are confined to Panama.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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THE LECYTHIDACEAE OF CENTRAL AMERICA

By H. Pittier

INTRODUCTION

Up to 1908, only four species, belonging to three genera of the family Lecythidaceae, and ranging from the Canal Zone to Nicaragua, had been reported from Central America. They were *Gustavia superba*, *Grias fendleri*, and *Couroupita odoratissima* and *C. nicaraguensis*. In the course of that year three new species and two genera (*Lecythis costaricensis*, *Eschweilera collinsii*, *E. calyculata*) were added to the list, and the southward extension of *Couroupita nicaraguensis* along the Pacific coast was reported.[1] Northward, Nicaragua seems to remain the extreme limit reached by the family.

The botanical explorations of Panama undertaken under the auspices of the Smithsonian Institution and started in 1909, led me to the magnificent forests of the southeastern parts of that country, in the district of Port Obaldía on the Caribbean side, and in the Sambú and Tuyra valleys of the Pacific watershed. The study of the flora of these extraordinarily rich plains and hills was only started, though with wonderful glimpses of its composition. The presence in our collections of representatives of genera such as *Brownea*, *Centrolobium*, *Mimusops*, and *Lucuma*, hitherto considered as almost exclusively South American, and, above all, the abundance of undescribed forms of Lecythidaceae, of which no less than 11 are here described for the first time, revealed the existence in that region of a real miniature of the Amazonian silva, miniature in extension but quite as majestic in the dimensions of its elements. In fact, the forests of the Panamanian Darién are the most perfect type of tropical rain forests which it has been my privilege to contemplate in forty years of neotropical exploration. This is not the place to discuss the causes which have given rise to the development of such a remarkable flora, or its relationships with that of the central and eastern sections of the South American continent. The facts at hand are not sufficient. In the first place, the study of the forests in question has only been initiated and they reserve innumerable sur-

[1] Contr. U. S. Nat. Herb. 12: 95–104. 1908.

prises; moreover, our knowledge of the flora of the plains along the western Caribbean seaboard and the Pacific coast of Colombia is too scanty to allow even tentative conclusions.

The present paper contains the descriptions of all the species, pertaining to five genera, hitherto reported from Central America, including Panama. I do not consider the subject as exhausted. More species of the genera already represented will be found, and at least one genus, *Cariniana*, abundant in the forests of the Sinu and Atrato valleys, is likely to exist also in Darién.

SYSTEMATIC TREATMENT

KEY TO GENERA

Androecium equally expanded all around, so forming a sort of regular cup or ring, with the terminal part of the stamens involuted. Fruit indehiscent, the whole intrastaminal disk flat, more or less impressed and limited by a circular ridge.

Anther cells free, rounded, splitting longitudinally. Seeds 1 in each cell; funicle about the length of the seed; sepals 2 ..... **1. GRIAS.**

Anther cells connate, more or less elongate, opening by apical pores. Seeds 6 in each ovary cell, suspended by long fleshy twisted funicles; calyx very short and entire, or 5 or 6-lobate ..... 2. GUSTAVIA.

Androecium expanded on one side as a hood-shaped plate.

Stamens all fertile; fruits cannon-ball-like, indehiscent, with only the innermost part of the intrastaminal disk marked out as a domelike opercule. Septa and placentas turning into a semiliquid pulp. **3. COUROUPITA.**

Stamens of the hood mostly sterile; fruit dehiscent, the opercule formed by the whole intrastaminal disk.

Seeds large, fusiform, hanging from a fleshy funicle; fruit large, with very thick, woody walls; giant trees, with small serrate leaves. **4. LECYTHIS.**

Seeds small, rounded, sessile and erect in the coriaceous fruit; middle-sized trees with entire leaves ..... 5. ESCHWEILERA.

1. GRIAS L.

1. Grias fendleri Seemann, Bot. Voy. Herald 126. 1854.

A tree 8 to 12 meters high; trunk about 33 cm. in diameter, divided almost from base; limbs erect, dark grayish.

Leaves densely fasciculate on new wood, sessile, obovate-spatulate, long-cuneate, acute, entire or obscurely serrate toward the apex, 25 to 65 cm. long, 4 to 11 cm. broad; costa and primary veins prominent on both faces but more so underneath; primary veins about 35 on each side, anastomosed along the margin of the blade.

Inflorescence racemose, simple, entirely glabrous; rachis very short; floral pedicels 5 to 7 mm. long, each with one diminute basal bractlet. Calyx ovoid, about 6 mm. long and 5 mm. in diameter, 4-lobulate and with a dark margin; lobules obtuse. Petals 4, concave, ovate-elliptic, obtuse, smooth, white, 12 to 14 mm. long, 9 to 10 mm. broad. Androphore cup-shaped, white, about 3 mm. broad, multi-appendiculate, the interior appendices about 2 mm. long, the

exterior ones involute, 6 to 8 mm. long; anthers sessile or subsessile; ovary ovoid-turbinate, 4-celled, the cells pluriovulate; stigma subsessile, 4-lobulate.

Pyxis 1-celled, 1-seeded, ovoid, green on the outside, about 3 cm. long and 2.5 cm. in diameter, borne on a pedicel nearly 1 cm. long and bearing at the apex the enlarged stigma. Pericarp thin, fleshy; mesocarp membranous, 8-costulate. Seed ovoid, 28 to 30 mm. long, 17 mm. in diameter, smooth, suspended from the top of the cell by a thin funicle. Embryo almond-like, but very bitter and not edible.

PANAMA: In forests near Chagres, flowers, Feb. 12, 1850, *Fendler* 185 (type), 187. Below Pinogana, Darién, on the right margin of Tuyra River, flowers, April 18, fruits, June 15, 1914, *Pittier* 6652.

Our specimens differ from the type in the number of the pairs of primary veins (35 instead of 38), in the ovoid shape of the alabastrum, in the mostly 4-lobed calyx, and in having the ovary smooth and rounded instead of tetragonous; but these particulars are so insignificant that there is hardly a doubt as to our tree being identical with the one collected by Fendler. The full description of the species is based on better and more complete material than that distributed by the last collector.

2. GUSTAVIA L.

KEY TO SPECIES

Fruits small, regularly winged or costate; leaves small, entire or almost so; calyx 6-lobulate.

Fruits winged ..... 1. G. brachycarpa.

Fruits costate ..... 2. G. pleurocarpa.

Fruits large, more or less smooth; leaves long, spatulate and narrow, more or less sinuate or toothed; calyx entire.

Leaves sessile or almost so; middle-sized tree with large showy flowers. 3. G. superba.

Leaves long-petiolate; cauliflorous tree ..... 4. G. nana.

1. **Gustavia brachycarpa** Pittier, sp. nov.

A tree 12 to 15 meters high, 30 to 35 cm. diameter at the base; trunk straight, about 6 meters high. Bark grayish, smooth. Branching diffuse, forming a rounded crown, the long boughs more or less hanging. Young branchlets green, smooth, finely striate longitudinally.

Leaves alternate, membranous, petiolate, glabrous, dark green above, paler beneath; petioles 8 to 10 mm. long, subalate; leaf blades obovate or ovate-elliptic, attenuate at base to narrow wings, acuminate at tip, 10 to 20 cm. long, 3.5 to 7 cm. broad; margin slightly sinuate-dentate on the upper half of the blade, entire on the lower half; costa prominent on the lower face, hardly so on the upper one; primary veins 14 or 15, arcuate and twice anastomosed along the margin; veinlets inconspicuous; stipules triangular, acute, about 4 mm. long, early caducous.

Flowers not known, apparently single or few together at the ends of the branchlets.

Pyxis small, ovoid, flat or slightly depressed at the top, 5 or 6 celled, dehiscent, sessile, but attenuate at the base as a (2.5 cm. long) 4-winged pseudo-pedicel. Body of the pyxis about 2.5 cm. long, 2 cm. in diameter, 6-winged, the (5 mm. wide) wings alternating with the persistent erect triangular-acute sepals, these 10 to 12 mm. long and 10 mm. broad at the base; pericarp about 2 mm. thick, woody and hard; interzonal band flat, 2.5 mm. wide. Operculum about 1.5 cm. in diameter, not seen. Fertile seeds 2

or 3 in each fruit, the remaining cells occupied by aborted seeds; funicle fleshy; seed ovoid, about 12 mm. long, with a brown perisperm, paler and torulose around the large apical micropyle.

Type in the U. S. National Herbarium, no. 715480, collected in woods around San Felix, eastern Chiriquí, Panama, December 23, 1911, by H. Pittier (no. 5269).

This species has the smallest fruits observed heretofore in the genus. Its nearest ally is *G. pterocarpa* Poit. of Guiana.

2. Gustavia pleurocarpa Pittier, sp. nov.

A tree up to 20 meters high and about 40 cm. in diameter; trunk straight; bark brownish, slightly roughened; branching radiate, forming an elongate crown; branchlets slender, flexible, with a smooth, finely striate, brownish bark.

Leaves petiolate, membranous, entirely glabrous; petioles 1.5 to 2 cm. long; leaf blades ovate-elliptic, 8 to 19 cm. long, 3.5 to 7 cm. broad, attenuate and decurrent on two-thirds of the petiole length at base, subacuminate and more or less acute at tip; margin entire; costa prominent on both sides of the blade, the more so beneath; primary veins about 8, slightly arcuate, arcuately anastomosed along the margin, prominent beneath, with the interspaces minutely reticulate.

Flowers terminal, single or geminate, about 6 cm. in diameter when spread, the peduncle, bracts, receptacle, and calyx lobes furfuraceous; peduncles 2 cm. long, rather thick, provided at the middle with a pair of ovate acute bracts 4.5 mm. long; receptacle 6-costate, about 7 mm. in diameter; calyx lobes 6, triangular or ovate, acute, nearly 7 mm. long with about the same basal breadth, persistent; petals 6, the 3 exterior ones larger, ovate, rounded at tip, 3 to 3.5 cm. long, about 2 cm. broad, yellowish white, more or less furfuraceous without, glabrous within; androecium equally expanded all around, about 22 mm. in diameter; anthers ovate, subacuminate, emarginate at base, 1.8 mm. long; ovary 6-celled, each cell pluriovulate; style very short; stigmas 6, erect and adhering.

Young fruits crowned with persistent calyx lobes and more or less 6-costate.

Type in the U. S. National Herbarium, no. 678933, collected on Loma de la Gloria, back of Fató, Province of Colón, Panama, altitude 100 meters or less, July, 1911, by H. Pittier (no. 3857).

The following collections also belong here:

PANAMA: Loma de la Gloria, August, 1911, *Pittier* 4104 (flowers); Sept. 12, 1911, *Pittier* 4426 (young fruits).

This species seems to differ from all the Gustavias of the Isthmus and adjacent South America by its small leaves and flowers, the latter exclusively terminal, and by the general habit of the tree, which looks much more like an *Eschweilera*.

3. Gustavia superba (Kunth) Berg, Linnaea **27**: 444. 1854. PLATES 1, 2.

Pirigara superba Kunth, Syn. Pl. Aequin. **3**: 426. 1824.

A tree, up to about 20 meters high and 35 cm. diameter at the base, sparingly ramified, the limbs erect or ascending, usually unbranched, glabrous, covered with the leaf scars, the younger part fistulous.

Leaves congested at the ends of the limbs, entirely glabrous, membranous; petioles thick, 2 to 9.5 cm. long; blades oblong-lanceolate, long-cuneate and subdecurrent at base, acutely long-acuminate at apex, 25 to 100 cm. long, 8 to 18 cm. broad, light green on both sides, the margin coarsely and remotely serrate with acute teeth; costa thick, prominent on both sides; primary veins 20 to 25 on each half of the blade, prominulous above, prominent beneath, united by slender transverse veinlets and a dense prominulous reticulation of lesser thickness.

Flowers congested on the old wood just below the lower leaves, the racemes 2 to 12-flowered, glabrous; peduncles thick, 2 to 6 cm. long; pedicels 5 to 9 cm. long, puberulous, provided at the base with an ovate obtuse bract about 5 mm. long, articulate at the middle, with a pair of clasping, more or less adnate bractlets, these very short and broad; open flowers 8 to 12 cm. in diameter; receptacle discoid, flat, about 2 cm. in diameter; calyx short (not over 1 cm. broad), minutely puberulous-pubescent, the margin entire; petals 8 (4 slightly larger), obovate, slightly attenuate to the base, rounded-obtuse at apex, 5 to 7 cm. long, 2 to 3 cm. broad, glabrous, yellow at base, turning to pink dotted with white toward the apex; androphore pinkish white, discoid, about 4.5 cm. in diameter; stamens and staminodes yellow at base, turning to pink toward the tip; ovary turbinate, 6-celled, velvety-pubescent on the upper face; style obtuse and very short.

Pyxis large, subglobose.

Type collected at Turbaco, near Cartagena, Colombia, by Humboldt and Bonpland. Common in the Canal Zone and in its immediate vicinity, but not reported from farther west and apparently not found in south Darién or in the rainy parts of the San Blas Coast.

PANAMA: Chagres Valley, *Pittier*. Empire, May 2, 1912, *Christopherson* 197. Monte Lirio, March 2, 1912, *Christopherson* 128. Hospital grounds at Ancón, February 14, 1911, *Pittier* 2746; March, 1910, *C. F. Mason*. Gatuncillo, *Stevens* 1159. Gamboa, *Stevens* 1090; *Standley* 28389. Obispo, *Standley* 31709. Tapia River, *Maxon & Harvey* 6746a. Gorgona, *Maxon* 6787. Chagres arm of Gatún Lake, *Maxon* 6554. Barro Colorado Island, *Standley* 31447, 31253. Darién Station, *Standley* 31553. Fort Sherman *Standley* 30955. Taboga Island, *Standley* 27934. Río Paraíso, above East Paraíso, *Standley* 9917. Las Cascadas Plantation, *Standley* 25716, 29591. Hills north of Frijoles, *Standley* 27443.

According to Miers,[2] this species has been collected in Ecuador by Sinclair, which would mean a considerable extension of its area to the south. Seemann[3] states that in Panama it forms entire woods in the central districts, a fact which lacks confirmation. According to my personal experience, even small groves of the tree are of rare occurrence and it is found mostly scattered as single individuals. Seemann refers this species to *G. angustifolia* Benth., but in that the leaves are almost sessile and comparatively narrow, the flowers smaller and terminal with the pedicellar bractlets near their base, and the petals mostly 6.

The fruit of *Gustavia superba* Berg is edible, but in no way distinguished by its flavor or nutritive properties. The usual vernacular name applied about the Canal Zone to the tree is "membrillo."

EXPLANATION OF PLATE 1.—*Gustavia superba*. Inflorescence, about one-tenth natural size. PLATE 2.—A flower. Natural size.

4. Gustavia nana Pittier, sp. nov. PLATES 3, 4.

A small single-stemmed cauliflorous shrub about 1.5 meters high, the trunk not over 6 cm. in diameter at the base.

Leaves dense at top of stem, alternate or subverticiliate; petioles 3 to 15 cm. long, slender, terete; leaf blades narrow-elliptic, attenuate at both ends, hardly decurrent but extending along the petiole in two almost inperceptible keels, 21 to 40 cm. long, 5 to 8 cm. broad; margin slightly sinuate-dentate, the teeth distant about 1.5 cm. in the middle part of the blade; costa and veins prominent on both sides but more so on the lower face; primary veins about

[2] Trans. Linn. Soc. **30**: 177.

[3] Bot. Voy. Herald 126. 1854.

17, straight and anastomosed along the margin, the transverse veinlets well marked on both faces.

Flowers not seen, appearing near the base of the trunk.

Pyxis rather large, borne on a pedicel 3 cm. long, globose-subpyriform, the body 7 cm. long and 7 cm. in diameter, 5-celled, obsoletely costate; calycinal zone prominent and bearing the remnants of the calyx; interzonal band flat, 2.5 mm. broad; operculum slightly convex, apiculate-umbonate, smooth and lustrous, bright yellow; pericarp coriaceous, about 5 mm. thick, smooth and light brown outside; inner pulp yellow. Seeds 1 to 3 in each cell, angulose, irregularly shaped and compressed, 2 to 3 cm. long and broad; testa membranous, brownish.

Type in the U. S. National Herbarium, no. 679189, collected on Loma de La Gloria, back of Fató, Province of Colón, Panama, in fruit, August 4, 1911, by H. Pittier (no. 4093).

This differs from all other described species in its reduced size and in the petiolate leaves.

EXPLANATION OF PLATE 3.—*Gustavia nana*. A fruit on branch. About seven-eighths natural size. PLATE 4.—Fruits and seeds; above an operculum, below cross section of fruit. Natural size.

3. COUROUPITA Aubl.

Owing to the scarcity of the cannon-ball trees, it has been found difficult to obtain satisfactory specimens. For this reason the three following species are incompletely described.

KEY TO SPECIES

Flowers 4 to 5 cm. in diameter; anther cells divaricate from the base; petals pink; low spreading savanna tree, branched almost from the base. **1. C. odoratissima.**

Flowers 7 to 8 cm. in diameter; anther cells connate; petals white, pink, or reddish-tinged; high forest trees.

Petals 1.8 to 2.2 cm. broad; filaments of the anthers 1 mm. long; corolla reddish white **2. C. nicaraguensis.**

Petals 2.2 to 3 cm. broad; filaments of the anthers 2 to 2.5 cm. long; corolla pinkish white **3. C. darienensis.**

1. Couroupita odoratissima Seem. Bot. Voy. Herald 126. 1854.

A large tree, divaricate from the base; crown spreading, domelike; branchlets thick, rounded, striate, verruculose.

Leaves oblong, attenuate at both ends, abruptly acuminate, sparsely hairy, the pubescent petiole thick, 1 to 1.5 cm long, the lamina 15 to 19 cm. long, 6 to 8 cm. broad; margin entire, obscurely sinuate, or minutely ciliate-denticulate; venation hardly prominent above, more so beneath, the costa and primary veins here densely hairy-puberulent; stipules small, subcordate, puberulous, early caducous.

Floral racemes issuing from the trunk and larger limbs, also terminal (?); rachis thick, about 18 cm. long, angulose-sulcate, glandulose-verruculose, tomentose, many-flowered. Flowers large, fragrant; pedicels 13 to 19 mm. long, at first brown-tomentellose and then subglabrous; sepals obtuse, ciliate; petals oblong-obtuse, fimbriate on the margin, pink with yellow lines; androphore of a rich yellow color; stamens short, crowded on both the ring and the hood; anther cells divaricate at the base.

Fruit large, globose, single or in clusters.

PANAMA: Forests of Río de Jesús, between Santiago and Puerto Mutis, Veraguas, *Seemann* 1151, in herb. Hook., type. Forests of Hato de San Juan, between San Lorenzo and San Felix, eastern Chiriquí, *Otto Lutz*, photograph.

The first locality was believed to be the only one in which the species occurred. The discovery by Dr. Lutz is consequently of great interest, so much the more so in that he found the tree loaded with fruits.

2. Couroupita nicaraguensis DC. Prodr. 3: 294. 1828.

Trunk high and straight, bearing a subglobose crown.

Leaves large, coriaceous, obtuse; flowers large, clustered on trunk and larger limbs, their greatest diameter 7.5 cm.; calyx lobulate; petals 6, obovate, obtuse, the 3 exterior ones slightly smaller, 2 to 3.5 cm. long, 1.8 to 2.2 cm. broad, reddish white; stamens numerous upon both ring and hood; filaments about 1 mm. long, swollen at the tip on the ring, attenuate on the hood; anthers ovoid, 0.5 mm. long and broad, the cells connivent.

Fruits large, globose, single or 2 to 8-clustered.

NICARAGUA: Cited from that country without precise locality by de Candolle. Vicinity of Paso Real, road from Rivas to Granada, near Río Ochomogo, *Oersted*. Along the Ochomogo River, north of Rivas, *Shannon* 5004.

COSTA RICA: Salinas Bay, *Pittier* in 1891; Nicoya, *Pittier* in 1903.

The above description is based upon the original description in the Prodromus, upon Oersted's notes, upon the incomplete specimens collected by Shannon, and upon the writer's own observations. It is more complete than the one given in my former paper on the subject, but yet far from satisfactory.

3. Couroupita darienensis Pittier, sp. nov. PLATE 5.

A very large, deciduous tree, the trunk straight, up to 30 meters high and 1.25 meters diameter at the base; main limbs radiating horizontally from the apex of the trunk and forming a flat, sparsely branched crown; bark of the trunk and limbs thick, scaly, brownish gray, that of the branchlets fibrous, the fibers strong; wood brownish, ill-scented.

Leaves unknown, undeveloped at time of flowering.

Floral racemes short, growing from the limbs and larger branchlets. Corolla pinkish white, 7 to 8 cm. in diameter; petals 6, fleshy, unequal, ovate, rounded at base, broadly rounded at apex, 2.5 to 4 cm. long, 2.2 to 3 cm. broad, glabrous; androphore pinkish white, broadening from the ring (1.8 cm. in diameter) to the galea (2.8 to 3 cm. broad); stamens very numerous and entirely covering the inner surface of the androphore, the ones on the ring and ligule small, with clavate (1.2 to 1.5 mm. long) filaments and subglobose anthers, the ones on the galea with broad attenuate (2 to 2.5 mm. long) filaments and larger anthers. Other details of the flower not known.

Pyxis very large, globose or slightly depressed, 15.5 to 18 cm. in diameter, 6-celled, the calycinal zone apical and obsolete, the seeds few, orbiculate, depressed, hairy, surrounded by the pulpy dissepiments of the endocarp and columella.

Type (fruit, seeds, parts of flower in alcohol, and photograph) in U. S. National Herbarium, collected in forests around Piñogana, southern Darién, Panama, April 20, 1914, by H. Pittier (no. 6563).

This species was tentatively compared first with *Couroupita peruviana* Miers, which differs in the coloring of the flower, and in the larger fruit with the calycinal zone much more distant from the apex, and then with the little-known *C. nicaraguensis* DC., also distinct in the mode of branching, the smaller flowers, and the details of the stamens.

This is one of the tallest trees in the forests of Darién. The trunk is always clean to a considerable height and the limbs spread horizontally at a great distance from its apex. The flower racemes appear on the latter or on smaller

branchlets, but never on the trunk, at a time when the leaves are not yet developed. The wood is characterized by its fetid smell.

The tree is known among the natives as "coco zapote" or "coco de mono."

EXPLANATION OF PLATE 5.—*Couroupita darienensis*. A tree in forest.

4. LECYTHIS Loefl.

KEY TO SPECIES

Leaves large (12 to 36 cm. long), coriaceous, ovate-oblong or elliptic, the margin entire or obscurely crenate.

Blade of the leaves decurrent on the petiole, rounded at the apex; pyxis 15 to 16 cm. high, the basal band 5.5 cm. high, the interzonal band 7 to 7.5 cm. broad. South Darién ..... 1. L. melliana.

Blade of the leaves rounded at the base, acuminate at the apex; pyxis 12 to 14.5 cm. high, the basal band 6 to 8 cm. high, the interzonal band 4 to 5 cm. broad. South Darién ..... 2. L. tuyrana.

Leaves small (not over 10 cm. long), membranous, ovate, crenulate-serrate.

Base of the operculum distinctly conical, with a smooth surface, about 7 cm. in diameter; calycinal zone continuous, the individual sepals hardly distinct. San Blas Coast ..... 3. L. armilensis.

Base of the operculum more irregular and broad (not under 9 cm. in diameter).

Leaves rounded or subcuneate at the base; pyxis ovoid, about 20 cm. high; basal band 11 to 12 cm. high, the interzonal band 4 to 7 cm. broad. San Blas Coast ..... 4. L. ampla.

Leaves cordate at the base; pyxis subglobose, 15.5 to 22 cm. high, the basal band 8 to 14 cm. high, the interzonal band 6 to 9 cm. broad. Costa Rica. 5. L. costaricensis.

1. Lecythis melliana Pittier, sp. nov. PLATE 6.

A large tree, up to 40 meters high and 80 cm. in diameter, the trunk straight, covered with a grayish rimose bark, the branching radiate, beginning about 8 meters above the ground.

Leaves coriaceous, glabrous, the petioles thick, canaliculate, 1.5 to 2.5 cm. long, the blades ovate-oblong, rounded and decurrent on the petiole at the base, rounded at the apex, 12 to 35 cm. long, 10 to 14 cm. broad, the costa thick, impressed above, very prominent beneath, the primary veins about 33, prominulous on both faces, with short intermediate parallel venules forming a striate zone on both sides of the costa; margin entire, sometimes slightly repand.

Inflorescence paniculate, few-branched, the rachis thick, angular, glabrous. Flowers sessile, sulphur or orange-yellow, 5 to 6 cm. in diameter when fully open; calyx tube 5 to 6 mm. long, salver-shaped, the 6 lobes (imbricate in bud) broadly ovate, obtuse, coriaceous, 9 to 11 mm. long and broad, the margin entire and revolute; petals ovate or obovate, obtuse at apex, more or less attenuate and adnate together and with the androphore at the base, about 4 cm. long and 2 cm. broad; androphore yellow, the basal ring 7 to 8 mm. broad, the ligule about 2 cm. long and 1.5 cm. broad, the hood ovate, shortly fimbriate on the margin; ovary 4-celled.

Pyxis subglobose, grayish brown and rough without, 15 to 16 cm. high, the walls 2 to 2.5 cm. thick, woody; basal part obconical, 5.5 cm. high; calycinal zone more or less continuous and even; interzonal band 7 to 7.5 cm. high, 15 cm. in diameter; operculum 3 cm. thick and 11.5 cm. in diameter; seeds 6.5 to 7 cm. long, 2.5 cm. broad, about 10 in each pyxis.

Type in the U. S. National Herbarium, no. 716604, collected in forest between Pinogana and Yavisa, southern Darién, Panama, in flower and fruit, April 17, 1914, by H. Pittier (no. 6538).

EXPLANATION OF PLATE 6.—*Lecythis melliana*. Two views of a pyxis. About three-eighths natural size.

2. Lecythis tuyrana Pittier, sp. nov. PLATE 7.

A tree 25 to 30 meters high; trunk straight; bark brownish, rimose; branchlets verruculose, covered with a white, longitudinally reticulate film. Crown ovate-elongate, densely leafy.

Leaves petiolate, large, coriaceous; petiole thick, clasping at the base, then winged and broadly canaliculate, 10 to 15 mm. long, darkish in color; lamina long-elliptic or lanceolate, rounded at base, acuminate at tip, entirely glabrous, glossy above, paler and dull beneath, 20 to 36 cm. long, 6 to 12 cm. broad; costa carinate on the upper side of the lamina, thick, rounded and prominent beneath; primary veins about 35, hardly salient on the upper face, rather prominent beneath; margin entire or obscurely crenate.

Inflorescence racemose, terminal, ample, erect, single-branched, 35 to 40 cm. long, the rachis thick, subangulose, puberulous. Flowers numerous, sessile; sepals 6, ovate, obtuse, coriaceous, the exterior ones a little broader, 6 to 8 mm. long, 6 to 9 mm. broad, glabrous, fimbriate-denticulate on the margin, persistent; corolla sulphur-yellow, caducous; petals 6, ovate to elliptic, concave, obtuse, 26 to 32 mm. long, 14 to 17 mm. broad, entire on the margin; androphore yellow, the basal ring rather narrow (5 mm.), the ligule about 20 mm. long and 1.2 mm. broad, the hood ovate, the marginal appendages about 5 mm. long; ovary 4-celled.

Pyxis subglobose, chocolate-brown and squamulous without, 12 to 14.5 cm. high, the walls 1.5 to 2 cm. thick, woody; basal part cupulate, 6 to 8 cm. high; calycinal zone continuous or obscurely lobate; interzonal band 4 to 5 cm. high, 11 to 13.5 cm. in diameter at the base, narrowing to the apex; operculum wanting; seeds about 6 cm. long, 2 to 2.5 cm. broad.

Type in U. S. National Herbarium, no. 716630, collected on the hills at Quebrada Honda, southern Darién, Panama, in flower and fruit, April 21, 1914, by H. Pittier (no. 6567).

EXPLANATION OF PLATE 7.—*Lecythis tuyrana*. Two views of a pyxis. About three-eighths natural size.

3. Lecythis armilensis Pittier, sp. nov. PLATE 8.

Very large tree, with straight trunk covered with a rimose fibrous bark, and a depressed spreading crown.

Leaves, flowers, and seeds unknown.

Pyxis large (17 cm. long and 15 cm. in larger diameter), ovoid, urn-shaped, rounded at base; calycinal zone high, distant 11 to 12 cm. from the base, continuous, the individual sepals hardly marked; interzonal band 4 to 7 cm. broad, slightly concave along the calycinal zone, and then straight to the rim of the mouth; operculum small, convex, smooth, 7 to 8 cm. in diameter, 2.5 to 3 cm. thick; pericarp thick, woody, showing within the remnants of the 4 original septa.

Type, consisting of old fruits only, in the U. S. National Herbarium, collected on hills between Puerto Obaldía and Armila, San Blas Coast, Panama, September 5, 1911, by H. Pittier.

The fruits here described are undoubtedly distinct from those supposed to belong to *Lecythis ampla*, from which they differ by their narrow mouth and the characters of the calycinal band. They resemble somewhat those of *L.*

densa Miers, a Brazilian species, the area of which is not likely to extend as far as Panama.

EXPLANATION OF PLATE 8.—*Lecythis armilensis*. Two views of a pyxis. About three-eighths natural size.

4. Lecythis ampla Miers, Trans. Linn. Soc. 30: 204. 1874. PLATE 9.

Very tall tree, 30 to 40 meters high, 1 to 1.5 meters in diameter. Trunk straight, 20 to 30 meters long, branching at the top only and forming a broad depressed crown; bark blackish, fibrous, rimose; branchlets virgate, dark purplish and verruculose.

Leaves small, membranous, petiolate, reticulate, glabrous and light green, estipulate; petioles slender, 6 mm. long; leaf blades orbicular, ovate, or ovate-elliptic, often sublobate, rounded or subcuneate at base, usually acuminate, sometimes rounded or obtuse at the tip, 3.5 to 9 cm. long, 2.5 to 4 cm. broad; margin finely sinuate-toothed, except at the base and on the acumen; costa prominent and dark-colored beneath, hardly so above; primary veins 12 or 13, straight, several times anastomosed along the margin, the intermediate spaces beautifully reticulate.

Flowers not known.

Pyxis large (20 cm. long and 15 cm. in larger diameter on calycinal zone), urn-shaped, rounded and hardly turbinate at the base; calycinal zone prominent, formed by 6 broad subacute protuberances, from 10 to 14 cm. above the petiolar insertion; interzonal band more or less concave around the calycinal and upper bands, 2.5 to 4.5 cm. broad; operculum convex, obscurely umbonate, 4 cm. high, about 10 cm. in diameter; pericarp thick, woody, showing within the remnants of a 4-celled division. Seeds not seen.

PANAMA: Hills of Sperdi, near Puerto Obaldía, San Blas Coast, leaves and old fruits only, September 3, 1911, *Pittier* 4343.

The above description of the pyxis of this species agrees in a general way with that of Miers' specimen from Antioquía. In our specimens the segments of the calycinal zone are more prominent and distinctly acute, and the upper part of the interzonal band is decidedly concave on account of the rim of the very broad mouth overflowing a little. The measurements agree only in a general way, but there is also a broad margin between those of the several specimens collected under the tree which was felled to obtain leaf specimens.

This *Lecythis*, which always grows on low hill ridges, is certainly one of the most conspicuous giants of the primeval forests of San Blas. Its crown always towers above the general dome of the forest. In its fall the individual sacrificed to obtain specimens opened a wide gap in the surrounding forest, thus giving an opportunity to collect several other interesting species.

EXPLANATION OF PLATE 9.—*Lecythis ampla*. Two views of a pyxis. About three-eighths natural size.

5. Lecythis costaricensis Pittier, Contr. U. S. Nat. Herb. **12**: 99. *pl. 6–8.* 1908. PLATE 10.

A large tree, up to about 40 meters high, the straight trunk 25 meters high, about 1 meter in diameter at the base, the crown depressed and spreading.

Leaves submembranous, glabrous, the petioles about 5 mm. long, the blade oblong or ovate-oblong, subcordate at base, long-acuminate, crenulate-serrate on the margin.

Inflorescences terminal; flowers not seen.

Pyxis ovoid-globose, 4-celled, brownish and smooth without, 15 to 22 cm. high, the walls 2.5 to 3 cm. thick, woody; basal band more or less semiglobose, 8 to 14 cm. high; calycinal zone continuous, with 6 distinct protuberances corresponding to the sepals; interzonal band 6 to 9 cm. high, conical, 16 to 17 cm.

in diameter at the base, 10 to 11 cm. at the apex; operculum domelike, 2 to 3 cm. high; columella thick and 4-winged. Seeds fusiform, sulcate, 4 to 5 cm. long, 1.7 to 2 cm. thick, 6 to 9 in each cell; funicle fleshy, thick, and white.

Type from La Sedina, plains of San Carlos, Costa Rica.

Since the first and incomplete description of this species in 1908 very little new information has been obtained. It is incorporated above. For more details see the original description.

It is interesting to note that the three species found on the Atlantic watershed (*I. armilensis*, *L. ampla*, *L. costaricensis*) all are very large trees with umbraculiform crown and small ovate serrate leaves, while the two found on the Pacific side of the continental divide are of lesser dimensions, have radiating branches beginning low on the trunk, and have leaves relatively larger and always entire. This may indicate that the representatives of both groups have reached the Isthmus by distinct routes and not simultaneously.

EXPLANATION OF PLATE 10.—*Lecythis costaricensis*. Two views of a pyxis. About three-eighths natural size.

5. ESCHWEILERA Mart.

KEY TO SPECIES

Pyxis woody, thick-walled, obconical, with the cavity rim projected outside.
  Leaves stipulate; petiole and base of costa sparsely hairy---1. **E. reversa.**
Pyxis coriaceous, thin-walled, more or less rounded or globose-depressed.
  Seed 1 in each cell of the fruit----2. **E. panamensis.**
  Seeds several in each cell.
    Floral racemes axillary. Seeds 3 or 4 in each cell----3. **E. garagarae.**
    Floral racemes terminal.
      Sepals free at base of fruit----4. **E. calyculata.**
      Sepals concrete with fruit.
        Fruit rather large; calycinal zone little prominent; seeds 4 cm. long, 1 to 3 in each cell----5. **E. collinsii.**
        Fruit small, with well-developed calycinal protuberances; seeds small, more than 3 in each cell----6. **E. verruculosa.**

1. Eschweilera reversa Pittier, sp. nov.

A large tree, nearly 80 cm. in diameter. Trunk straight; bark grayish, almost smooth; crown elongate; new growth slender, with purplish bark sparsely covered with long appressed hairs; buds quite hairy.

Leaves rather small, short-petiolate, stipulate, smooth except on the petiole and costa, light green above, paler beneath, the young ones deep pink at first on both sides and then only on the lower one; petioles thick, 3 mm. long, sparsely hairy; leaf blades ovate-elliptic, rounded and narrowly emarginate at base, acute at tip, 9 to 13 cm. long, 2.5 to 4.5 cm. broad; margin entire; venation prominent on both sides, more so beneath, the costa and primaries here pink; costa covered at base with whitish appressed hairs; primary veins 8 or 9, twice anastomosed along the margin; upper face of blade finely reticulate; stipules geminate, needle-like, hairy, about 4 mm. long.

Flowers not seen.

Pyxis small (3 to 3.5 cm. high, 6 cm. in diameter on calycinal zone), broadly turbinate, thick-walled, the 6 sepals grown into 6 thick prominences; interzonal band very narrow (not over 0.5 cm. broad) and forming a deep furrow; internal cavity smooth, widening toward the orifice, the margin of this rounded and projected outward; operculum arched or conical, depressed, the stigmatic remnants obscurely visible at the center. Seeds 2.

Type in the U. S. National Herbarium, no. 679550, collected on plains of Sperdi, near Puerto Obaldía, San Blas Coast, Panama, leaves and old fruit only, September, 1911, by H. Pittier (no. 4394).

In the absence of flowers and seeds, the place of this species remains doubtful. The pyxis is quite distinct from any described heretofore. There is a faint indication of a two-celled cavity in several of the specimens at hand, and the lower side of one of the only two opercula found under the tree bears the impression of two large seeds; but, since there were trees of *Eschweilera panamensis* scattered in the forest all around, the source of that lid is not absolutely certain.

2. Eschweilera panamensis Pittier, sp. nov.

A large tree, up to 25 meters high and 40 cm. in diameter. Trunk straight, covered with a gray, slightly rimose bark. Crown elongate; branchlets slender.

Leaves alternate, petiolate, coriaceous, glabrous, entire; petioles thick, broadly canaliculate, 5 to 8 mm. long; leaf blades ovate, rounded and subdecurrent at base, narrowed at the tip into a short acumen, light green above, paler beneath, 9 to 14 cm. long, 3.5 to 8 cm. broad; costa slightly salient above, quite prominent and obscurely 3-sulcate beneath; veins and veinlets obsolete above, beautifully marked beneath, the former 8 to 11, arched and distinctly anastomosed along the slightly revolute margin.

Inflorescences racemose, terminal or in the axils of the upper leaves, the axillary racemes short (4.5 cm.) and hardly branched, the terminal ones longer than the leaves (15 cm. or about), with well-developed alternate branchlets (10 cm. long); rachis minutely pubescent, with green verruculose bark. Flowers numerous, alternate, pedicellate, entirely glabrous, bractless, white; pedicels 7 to 8 mm. long; calyx lobes 6, rounded-triangular, obtuse, about 1 cm. long and broad; petals 6, uneven, 11 to 15 mm. long, 7 to 11 mm. broad, obovate and broadly rounded at tip, the 3 exterior ones larger, thicker, and conchoid; androphore with small ring, nearly 6 mm. in diameter and supporting numerous anthers; connecting blade of the hood 13 mm. long, 9 mm. broad; hood proper transversely ovate, 10 mm. long and 13 mm. broad, covered with numerous staminodes; filaments not over 0.5 mm. long; anthers ovate, emarginate at both ends, about 0.4 mm. long and broad, each cell splitting longitudinally; staminodes narrow and acute, 4 to 5 mm. long; ovary almost entirely superior, glabrous, 2-celled, with several ovules in each cell; style none; stigma obscurely divided.

Ripe pyxis globose-depressed, about 4 cm. long and 5 cm. in diameter, 2-celled, slightly attenuate at base, with rather thin walls; calycinal zone bearing the persistent enlarged lobes of the calyx, the interzonal band 1.5 to 2 cm. broad; operculum convex, depressed at the center with the stigma persistent, accrescent; cells 1-seeded, the seeds ovoid-oblong, 2.7 cm. long, 1.6 cm. in diameter.

Type in the U. S. National Herbarium, no. 679481, collected on hills back of Puerto Obaldía, San Blas Coast, Panama, flowers and fruits, September 2, 1911, by H. Pittier (no. 4338).

3. Eschweilera garagarae Pittier, sp. nov.

A small tree, the trunk straight and continuous; branching radiate, the crown pyramidal; bark smooth, grayish; branchlets slender, flexible.

Leaves membranaceous, glabrous, lustrous above, paler and opaque beneath, finely reticulate on both faces; petioles 1 cm. long, canaliculate; leaf blades elliptic or elliptic-lanceolate, 12 to 20 cm. long, 3.5 to 7 cm. broad, subcuneate at base, acuminate at tip; venation very prominent beneath; primary veins about

10, subimpressed above, arcuate and twice anastomosed along the obscurely sinuate margin.

Racemes axillary, simple, about 5 cm. long. Rachis verruculose; pedicels about 2 mm. long.

Pyxis coriaceous, thin-walled, 2-celled, globose-depressed, subturbinate at base, about 5 cm. long and 5.5 cm. in diameter on the line of dehiscence; calycinal zone very close to the base of the fruit, with the 6 prominences of the sepals little pronounced; interzonal band 16 mm. broad; operculum about 1 cm. high, convex, hardly umbonate. Seeds 6, sometimes 7, more or less ovate, compressed laterally, the two planes meeting toward the center of the fruit, rounded outside, about 3 cm. long.

Type in the U. S. National Herbarium, no. 715891, collected in the foothills of Garagara Mountain, south Darién, Panama, in fruit, February 6, 1912, by H. Pittier (no. 5616).

This species is characterized mainly by its globose-depressed fruits with the calycinal zone placed very low. In the absence of more complete material it is hardly possible to define its nearer affinities, but it certainly differs from all other Panamanian and Central American species.

4. Eschweilera calyculata Pittier, Contr. U. S. Nat. Herb. 12: 97. *pl. 1, 2.* 1908. PLATE 11.

COSTA RICA: Atlantic plains in the vicinity of Limón.

PANAMA: Marragantí, south Darién, in clearings, fruits and leaves only, April 22, 1914, *Pittier* 6596.

EXPLANATION OF PLATE 11.—*Eschweilera calyculata.* Leaves and pyxis. Natural size.

5. Eschweilera collinsii Pittier, Contr. U. S. Nat. Herb. 12: 97. *pl. 3.* 1908.

COSTA RICA: Plains of San Carlos.

6. Eschweilera verruculosa Pittier, sp. nov. PLATE 12.

A middle-sized tree with straight trunk, radiate branching, and elongate crown; bark grayish, almost smooth; branchlets obscurely 4-angled, slender and flexible, covered with a brownish, more or less striate and verruculose bark.

Leaves rather large, petiolate, coriaceous, reticulate on both sides, entirely glabrous; petioles thick, dark-colored (when dried), canaliculate, 0.8 to 1.8 cm. long; leaf blades elliptic or elliptic-ovate, rounded and subcuneate at base, acuminate at tip, 12 to 30 cm. long, 5 to 11 cm. broad; margin entire (with black glandular dots); costa and veins prominent on both sides, more so beneath; primary veins 12 to 15, arcuate, anastomosed along the margin; stipules absent or early deciduous.

Racemes terminal, 2 to 5 cm. long, 3 to 8 flowered; rachis simple, stiff, geniculate, verruculose. Flowers alternate, subsessile; receptacle and base of sepals densely covered with brownish verruculose excrescences, the former narrow at base; sepals 6 (imbricate in bud), ovate-obtuse, coriaceous, smooth except at base without, about 1 cm. long and 7 to 9 mm. broad; petals 6, large, pale yellow or yellowish white, obovate or oblong, rounded at tip, 2.4 to 3.2 cm. long and about 1.5 cm. broad; androphore large, the blade connecting the narrow fertile ring with the hood about 2 cm. long and 1.7 cm wide, the hood orbicular and about 1.3 cm. in diameter; stamens only on ring; filaments 2 to 2.5 mm. long, broad at base, thinner at middle, claviform and apiculate at the upper part; anthers broadly ovate, 0.6 mm. long, 0.8 mm. broad; staminodes lanceolate, acute, broader at the margin of the hood, 5.5 to 6.5 mm. long; ovary superior, 2-celled (?), with many ovules in each cell.

Pyxis middle-sized (3.5 to 4.5 cm. high, about 5 cm. diameter), globose-depressed, thick-walled, verruculose, the 6 sepals grown into 6 thick protu-

berances extending toward the conical base of the fruit; interzonal band about 6 mm. broad; operculum rounded, with a prominent tip, the overgrown stigma, at the center. Seeds numerous, small.

Type in the U. S. National Herbarium, no. 715506, collected in forests around San Felix, eastern Chiriquí, Panama, in fruit, December 24, 1911, by H. Pittier (no. 5290). Flowering material was obtained at the same locality September 8, 1912, *Pittier* 5738.

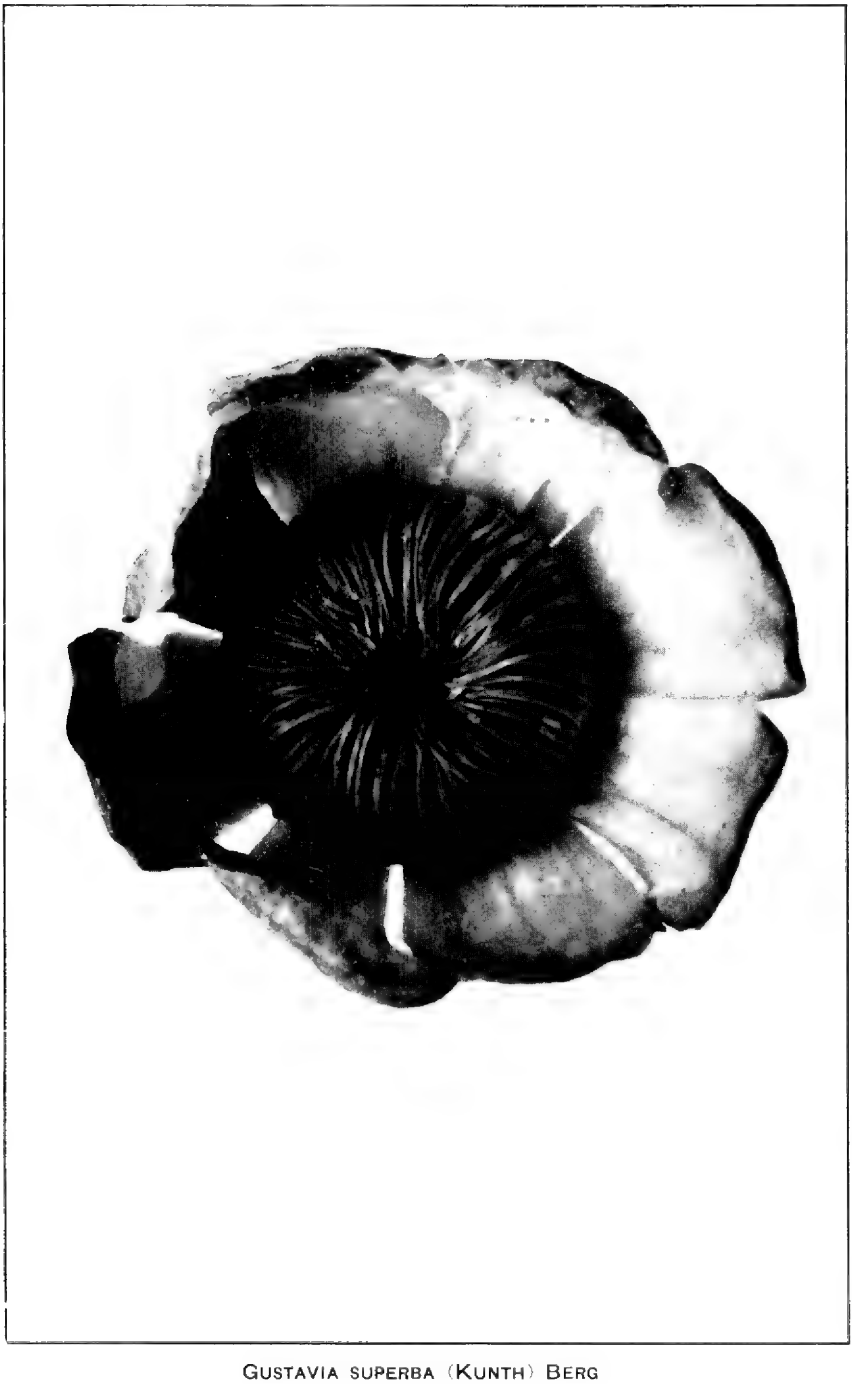
This is the "ollito" or "olleto" of the natives, so named because the fruit resembles a small earthen cooking pot. It seems to be nearly related to *Eschweilera verrucosa*, and was so identified, with doubt, by Seemann. The flowers, however, are much larger in our species and the shape of the fruit is quite distinct.

Eschweilera verruculosa is one of the most common trees of the lower belt of eastern Chiriquí.

EXPLANATION OF PLATE 12.—*Eschweilera verruculosa*. Leaves and pyxis. Natural size.

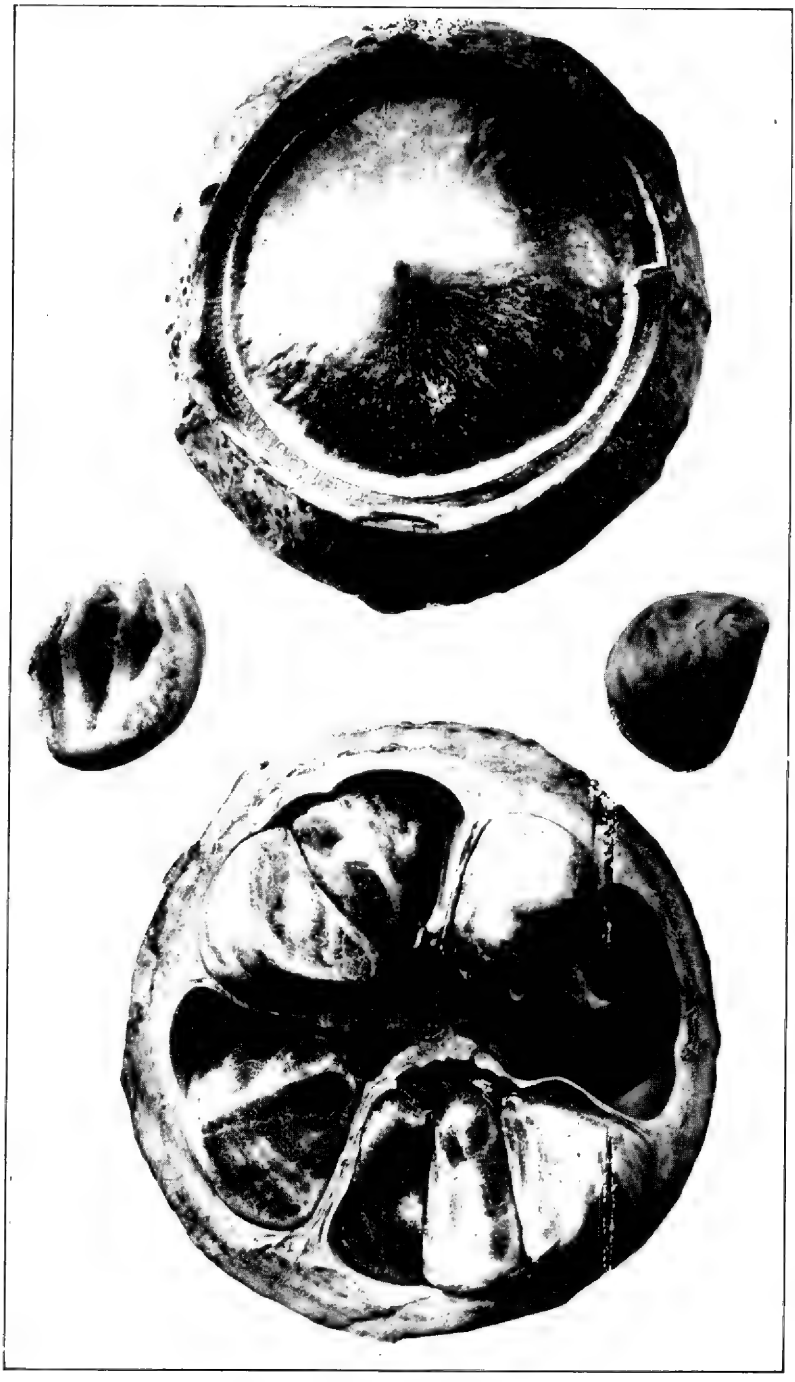
GUSTAVIA SUPERBA (KUNTH) BERG

22088—27——3



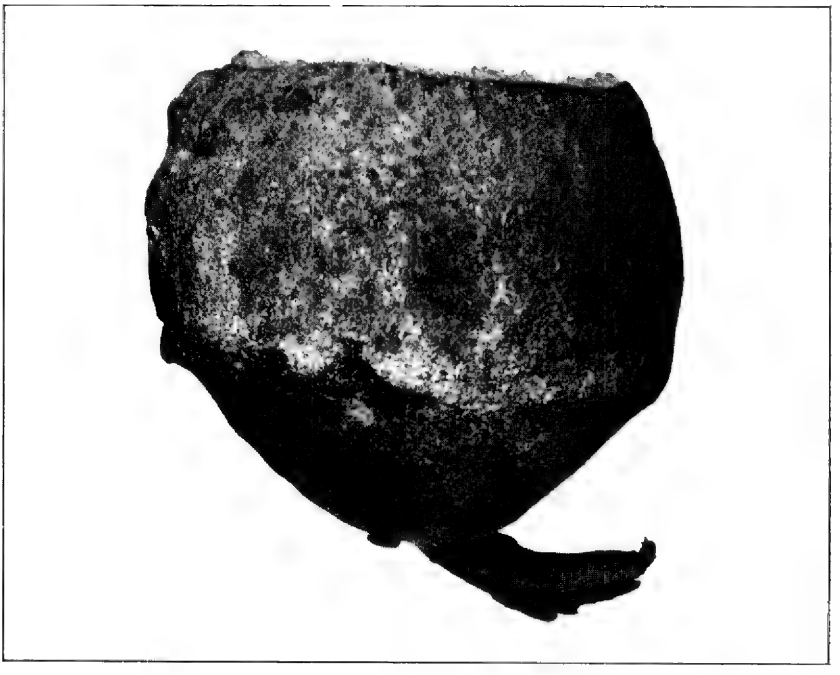
GUSTAVIA SUPERBA (KUNTH) BERG

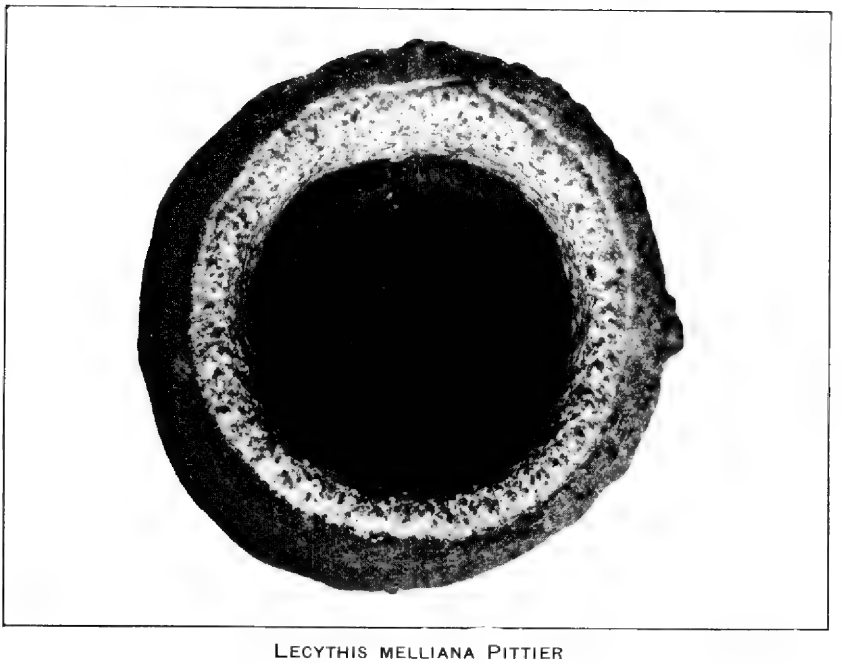
GUSTAVIA NANA PITTIER



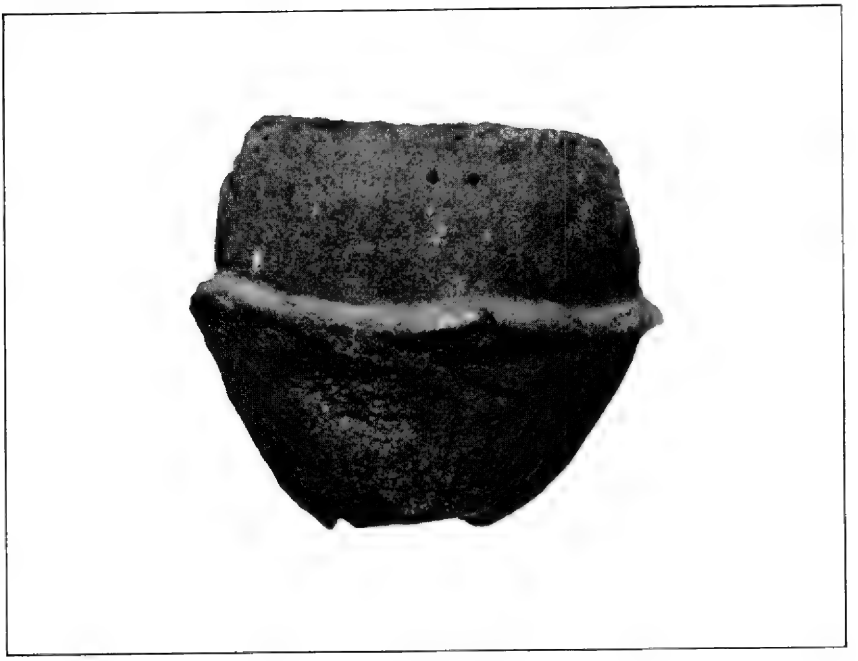
GUSTAVIA NANA PITTIER

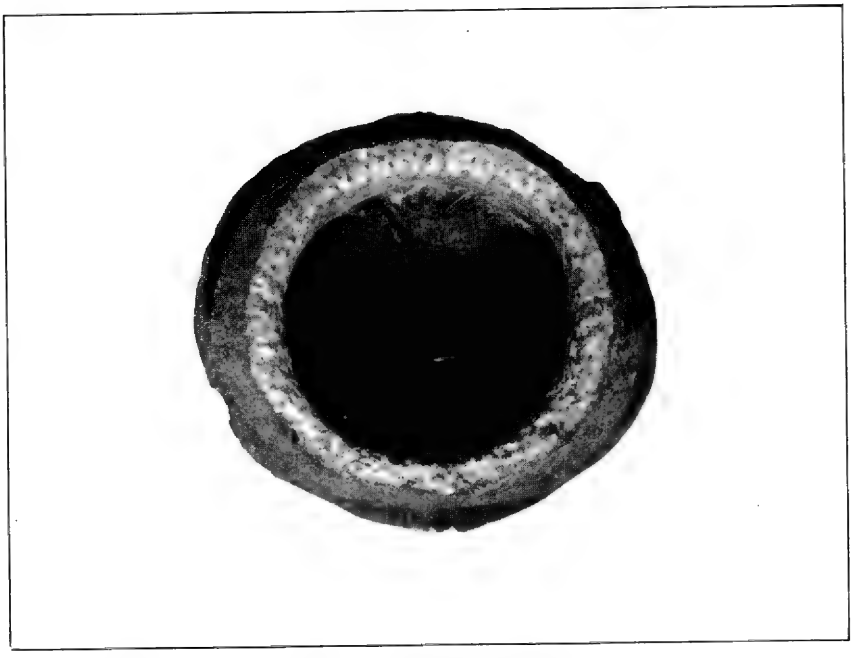
COUROUPITA DARIENENSIS PITTIER



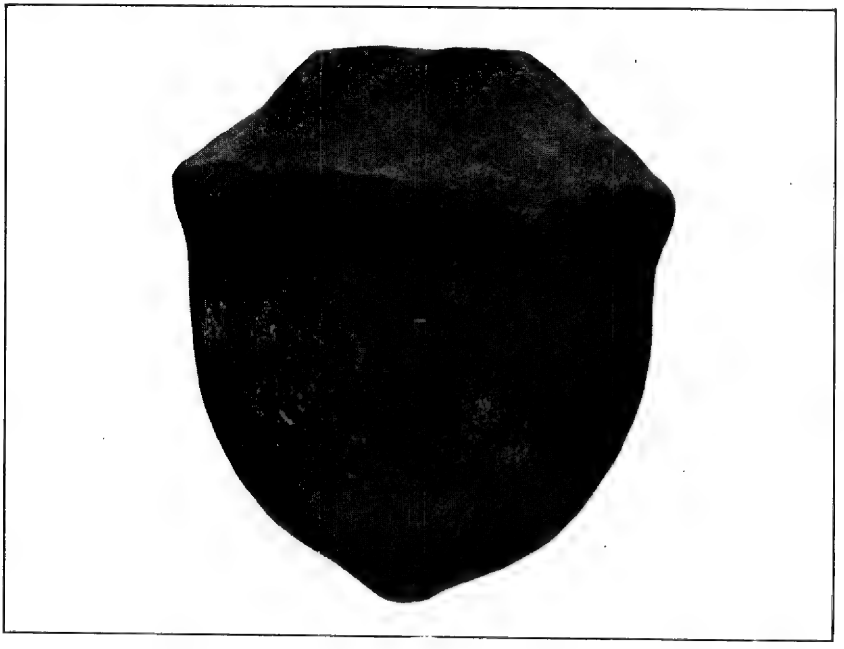


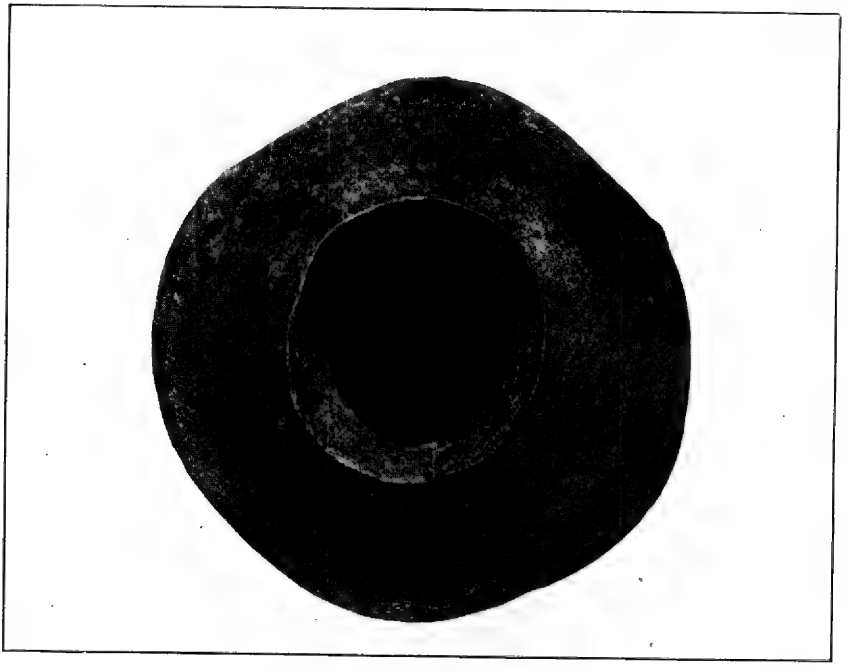
LECYTHIS MELLIANA PITTIER





LECYTHIS TUYRANA PITTIER





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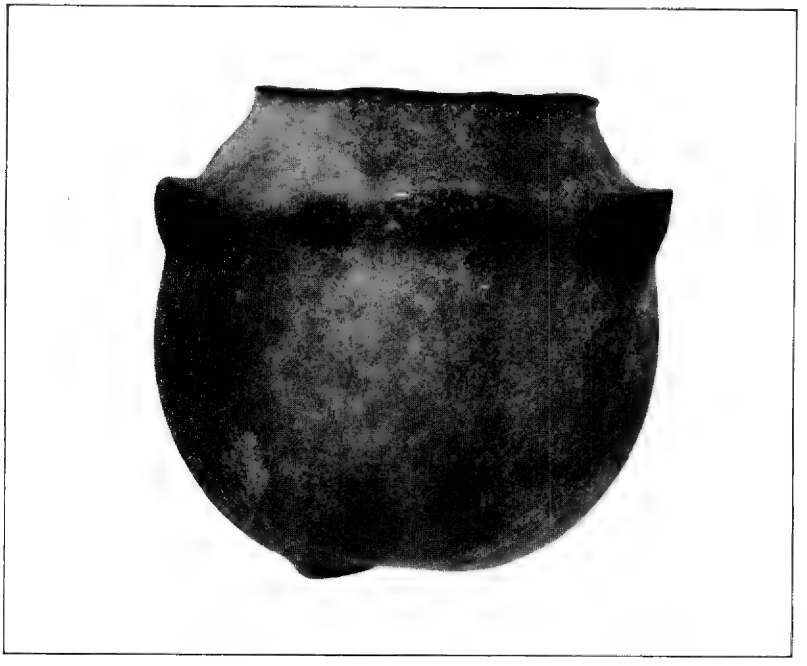

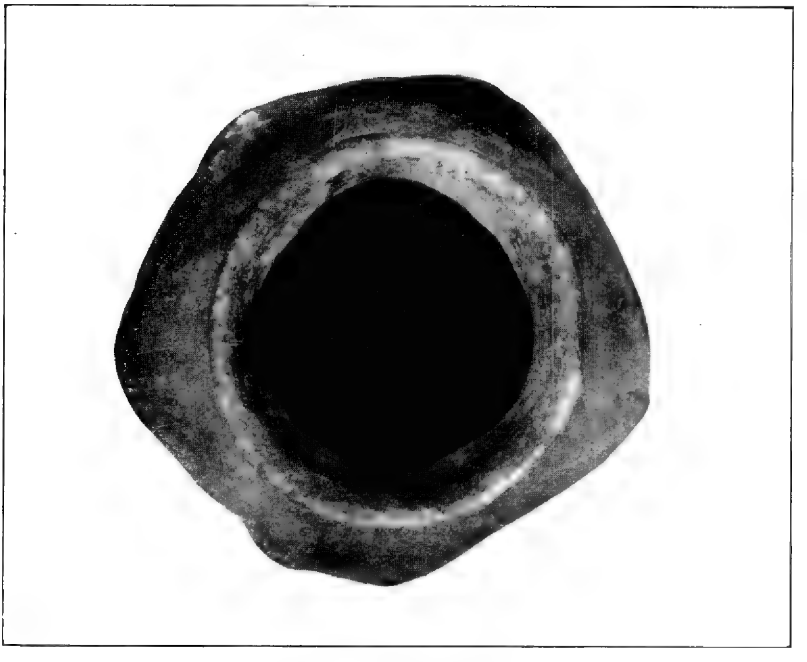

LECYTHIS AMPLA MIERS

LECYTHIS COSTARICENSIS PITTIER

ESCHWEILERA CALYCULATA PITTIER

ESCHWEILERA VERRUCULOSA PITTIER

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS

FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 26, PART 2

THE PIPERACEAE OF PANAMA

By WILLIAM TRELEASE

UNITED STATES
GOVERNMENT PRINTING OFFICE
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1927

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM

II

PREFACE

The second part of volume 26 of the Contributions from the National Herbarium consists of a revision, by Dr. William Trelease, University of Illinois, of the representatives of the Piperaceae or pepper family known to occur in Panama. Dr. Trelease is engaged at present in a monographic study of the American Piperaceae, and has undertaken the revision of all the Panama species in connection with the identification of a large amount of material obtained recently in the region of the Canal Zone.

One hundred and thirty-eight species are listed from Panama. They are referred to four genera, one of which is new.

The American Piperaceae are a conspicuous feature of the tropical forests, but they are of little economic importance. *Piper nigrum*, of the Old World tropics, furnishes the black pepper of commerce.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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THE PIPERACEAE OF PANAMA

By William Trelease

INTRODUCTION

No botanist who visits Central America can fail to take an interest in the great number of species of *Piper* and *Peperomia* which he finds everywhere in this region. The family is most abundantly developed in the wet forests of the Atlantic watershed, but many species of *Piper* and some Peperomias are common in the drier forests of the Pacific slope. It is Costa Rica, doubtless, which of Central American countries possesses the richest representation of the Pepper family, chiefly in the wet forests at middle and upper elevations, but in Panama also the family is well represented, as may be seen by the 138 species here listed.

There is no doubt that the real number of species existing in Panama is much greater, since no part of Panama except the region of the Canal Zone has been well explored botanically. The species of *Pothomorphe* are common and widely distributed plants, and this is true also of a few species of *Piper* and *Peperomia*. Most of the species of the latter genera, however, seem to be very limited in their distribution, and not until every secluded valley of Panama has been explored will it be possible to make a complete census of the Piperaceae of the country.

The species of *Piper* are mostly low shrubs, and it is easy to collect and preserve specimens of them. Most of the Peperomias are fleshy herbaceous epiphytes. It is difficult to collect them, and even harder to dry specimens, since there is no other group of Central American plants which dry so slowly in the press. For this reason the species of *Peperomia* are neglected by most collectors and inadequately represented in herbaria.

This paper is based largely upon the collections existing in the U. S. National Herbarium. These consist chiefly of material collected by Mr. H. Pittier and Dr. William R. Maxon in 1911 and 1912, in the course of the Smithsonian Biological Survey of the Canal Zone; by Mr. Ellsworth P. Killip in 1918 and 1922; by Dr. Maxon in 1923; by Dr. C. V. Piper in 1923; and by the present writer in 1923–24.

The collections of 1911–12 were identified by Casimir de Candolle, who based numerous new species upon them. The recent collections, as well as the earlier ones, were submitted to Doctor Trelease, who has kindly prepared the report here presented, which lists all the Piperaceae now known from Panama.—PAUL C. STANDLEY.

SYSTEMATIC TREATMENT

KEY TO GENERA

Stigmas 2 to 5 (mostly 3 or 4).
  Spikes axillary.
    Spikes several on a common peduncle. Plants suffruticose.
      1. POTHOMORPHE.
    Spikes solitary in the leaf axil. Plants suffruticose—**2. SARCORHACHIS.**
  Spikes opposite the leaves, solitary. Plants woody—**3. PIPER.**
Stigma 1, often penicillate. Plants herbaceous—**4. PEPEROMIA.**

1. POTHOMORPHE Miquel

Leave distinctly peltate—**1. P. peltata.**
Leaves cordate, not peltate—**2. P. umbellata.**

1. Pothomorphe peltata (L.) Miquel, Comm. Phyt. 37. 1840.
Piper peltatum ("*pelatum*") L. Sp. Pl. 30. 1753.
Peperomia peltata Dietr. Syn. Pl. 1: 142. 1831.
Lepianthes peltatum Raf. Sylv. Tellur. 85. 1838.
Heckeria peltata Kunth, Linnaea 13: 565. 1839.
TYPE LOCALITY: "America calidiore."
RANGE: Cuba, through the West Indies (the prototype figured by Plumier) and northern South America to Mexico on the mainland.
CHIRIQUÍ: Cerro de la Plata, San Felix, *Pittier* 5160. CANAL ZONE: Without locality, *Eppelsheimer*. Balboa, *Killip* 3064; *Standley* 25602. Fort Lorenzo, *Piper* 5929. Fort Sherman, *Standley* 30969. Frijoles, *Standley* 27619. Frijoles to Monte Lirio, *Killip* 12117. Gamboa, *Standley* 28525. Gamboa to Cruces, *Pittier* 3782. Gatún, *Standley* 27257. Juan Mina, *Piper* 5689. Las Cascadas Plantation, *Standley* 25797. Monte Lirio, *Maxon* 6858. Summit, *Stevens* 314, 315. Río Sirri, *Pittier* 4016. PANAMA: Río Tapia, *Standley* 28062. Río Tecumen, *Standley* 26735. DARIÉN: Boca de Cupe, *Williams* 697.

2. Pothomorphe umbellata (L.) Miquel, Comm. Phyt. 36. 1840.
Piper umbellatum L. Sp. Pl. 30. 1753.
Peperomia umbellata Kunth, Syn. Pl. Aequin. 1: 124. 1822.
Lepianthes umbellatum Raf. Sylv. Tellur. 85. 1838.
Heckeria umbellata Kunth, Linnaea 13: 569. 1839.
TYPE LOCALITY: Santo Domingo, Hispaniola.
RANGE: Through the West Indies; on the continent reaching Brazil and Peru to the south and Mexico to the north, in a number of often segregated forms, also (? naturalized) in tropical Asia and Africa.
CHIRIQUÍ: El Boquete, *Pittier* 3133.

2. SARCORHACHIS Trel., gen. nov.

Trailing or climbing, rather succulent, glabrous shrubs. Leaves alternate. Spikes solitary in the axils. Flowers spicate, perfect, naked, sessile, subtended by minute concave bracts. Stamens usually 4, distinct, essentially

hypogynous, short, with rounded anthers. Pistil 1, 1-celled, with a single erect ovule; stigmas mostly 4, sessile. Fruit a small 1-seeded drupe, partly immersed in and coalescent with the somewhat fleshy rachis at maturity.

Type species, *S. incurva* Trel. (*Piper incurvum* Sieber).

1. **Sarcorhachis naranjoana** (C. DC.) Trel.

Piper naranjoanum C. DC. Linnaea 37: 363. 1872.

TYPE LOCALITY: Naranjo, Costa Rica.

RANGE: Costa Rica and Panama.

DARIÉN: Sambú River, *Pittier* 5562.

3. PIPER L.

KEY TO SPECIES

1. Leaves palmately nerved ---- 2.
   Leaves pinnately nerved ---- 4.
2. Inner nerves confluent below ---- 3. P. pinoganense.
   Nerves separate to the base ---- 3.
3. Petiole short, wingless; leaves green ---- 1. P. smilacifolium.
   Petiole elongate, winged; leaves brown when dry ---- 2. P. san-joseanum.
4. Midrib subequally branched throughout ---- 5.
   Midrib without strong ascending branches upwards ---- 23.
5. Leaf base appreciably acute ---- 6.
   Leaf base appreciably obtuse, at least on one side ---- 16.
6. Leaves glabrous above ---- 7.
   Leaves pubescent above, large ---- 24. P. gatunense.
7. Leaves glabrous beneath ---- 8.
   Nerves (at least) pubescent beneath ---- 14.
8. Leaves about half as broad as long ---- 9.
   Leaves more elongate ---- 10.
9. Leaves 10 to 14 by 20 to 30 cm ---- 22. P. calocoma.
   Leaves scarcely half as large ---- 14. P. darienense.
10. Leaf base nearly equilateral ---- 11.
    Leaves distinctly oblique ---- 18. P. falcifolium.
11. Spikes scarcely 2 cm. long ---- 35. P. amphoricarpum.
    Spikes more elongate ---- 12.
12. Leaves drying green ---- 13.
    Leaves pale or bronzed beneath ---- 17. P. cordulatum.
13. Berries depressed-globose ---- 16. P. acutissimum.
    Berries ellipsoid-mucronate ---- 13. P. laxispicum.
14. Spikes scarcely 3 cm. long; leaves large ---- 27. P. latibracteum.
    Spikes more elongate ---- 15.
15. Leaves scarcely 4 by 14 cm ---- 15. P. trichopus.
    Leaves much larger ---- 23. P. polyneurum.
16. Leaves glabrous above ---- 17.
    Leaves somewhat villous on both faces ---- 24. P. gatunense.
17. Leaves large, granular or pitted ---- 18.
    Leaves scarcely 6 by 15 cm ---- 20.
18. Leaves firm and rugose ---- 27. P. latibracteum.
    Leaves thin and not rugose ---- 19.
19. Leaves coarsely glandular-granular ---- 23. P. polyneurum.
    Leaves finely glandular; pubescence white ---- 25. P. ladrillense.
20. Leaf base nearly equilateral ---- 12.
    Leaves distinctly oblique or shorter on one side ---- 21.

21. Leaves about half as broad as long---22.
Leaves more elongate---19. P. laevibracteum.
22. Leaves acuminate, 6 by 15 cm---20. P. subnudispicum.
Leaves rather blunt and smaller---21. P. tuberculatum.
23. Leaf base appreciably acute---24.
Leaf base appreciably obtuse, at least on one side---47.
24. Mature leaves glabrous above between the nerves---25.
Leaves scabrous or pubescent on both sides---76.
25. Leaves quite glabrous beneath---26.
Nerves, at least, puberulent or pubescent beneath---41.
26. Leaves about half as broad as long---27.
Leaves more elongate---31.
27. Spikes scarcely 1 cm. long---28.
Spikes more elongate---29.
28. Petiole winged; flowers perfect---34. P. wagneri.
Petiole wingless; dioecious---34a. P. wagneri minutispicum.
29. Leaves drying green, 5 by 11 cm---36. P. tenuimucronatum.
Leaves drying papery, rather large---30.
30. Stigmas sessile; berry subglobose---44. P. callibracteum.
Stigmas borne on a short style---47. P. papyraceum.
31. Spikes 2 cm. long; leaves dark-granular---33. P. magnantherum.
Spikes more elongate---32.
32. Petiole glabrous---33.
Petiole sparsely hirtellous or villous---40. P. hirtellipetiolum.
33. Leaves scarcely 5 by 14 cm.---34.
Leaves appreciably larger---39.
34. Some petioles winged or some leaves subcordate---10. P. chiriquinum.
Petiole not winged above the base---35.
35. Leaves green---36.
Leaves drying yellow beneath---38.
36. Leaves 3 or 5-nerved near the base---37.
Leaves not triple-nerved---12.
37. Midrib without ascending branches upward---38. P. san-lorenzanum.
Midrib with a few such branches---39. P. subtrinerve.
38. Leaves lance-oblong; plant glabrous---63. P. infraluteum.
39. Petiole 5 mm. long; spikes filiform---51. P. sambuanum.
Petiole 20 mm. long; spikes stouter---45. P. nitidifolium.
40. Nerves glabrescent beneath---37. P. tecumense.
Nerves persistently puberulent or pubescent beneath---41.
41. Leaves about half as broad as long---48. P. amphioxys.
Leaves more elongate---42.
42. Twigs glabrous, pale-granular---43.
Twigs at least locally or transiently pubescent---45.
43. Leaves granular-punctulate beneath---44.
Leaves not dark-punctulate; petiole short---52. P. storkii.
44. Petiole scarcely 10 mm. long---50. P. subnudibracteum.
Petiole 15 to 30 mm. long---45. P. nitidifolium.
45. Leaves glossy, equilateral at base---41. P. tapianum.
Leaves dull, oblique---46.
46. Leaves lanceolate---61. P. killipi.
Leaves lance-elliptic---55. P. lucigaudens.
Leaves lance-oblong---42. P. turbense.
47. Mature leaves glabrous above between the nerves---48.
Leaves rough or pubescent on both sides---76.

48. Leaves glabrous beneath ..... 49.
Nerves, at least, puberulent or pubescent beneath ..... 61.
49. Leaves about half as broad as long ..... 50.
Leaves more elongate ..... 57.
50. Leaves peltate ..... 51.
Leaves not peltate ..... 52.
51. Leaves oblong-ovate ..... 89. P. veraguense.
Leaves broadly ovate ..... 90. P. maxonii.
52. Spikes scarcely 1 cm. long ..... 28.
Spikes more elongate ..... 53.
53. Twigs glabrous ..... 54.
Twigs tomentulose ..... 4. P. pervenosum.
54. Twigs pale-granular ..... 55.
Twigs scarcely pale-granular ..... 56.
55. Leaf base suboblique ..... 43. P. davidianum.
Leaf base subequilateral ..... 10. P. chiriquinum.
56. Leaves about 6 by 12 cm ..... 12. P. crassispicatum.
Leaves distinctly larger ..... 11. P. pseudo-variabile.
57. Plants creeping or climbing ..... 84. P. reptabundum.
Plants not creeping ..... 58.
58. Twigs somewhat dark-granular ..... 59.
Twigs green-granular ..... 43. P. davidianum.
Twigs scarcely granular ..... 60.
59. Petioles not winged ..... 51. P. sambuanum.
Lower petioles winged ..... 9. P. dunlapi.
60. Leaves scarcely 12 cm. long ..... 60. P. septuplinervium.
Leaves much larger ..... 11. P. pseudo-variabile.
61. Older leaves rather deeply cordate or auricled, or peltate ..... 62.
Leaves at most cordulate or shallowly subcordate ..... 67.
62. Leaf base equilateral; petiole not winged ..... 7. P. paulownifolium.
Leaf base inequilateral ..... 63.
63. Petiole fleshy-warty ..... 92. P. imperiale.
Petiole not warty ..... 64.
64. Leaves subacute ..... 65.
Leaves long-acuminate ..... 66.
65. Leaves neither rugose nor peltate ..... 91. P. auritum.
Leaves rugose and peltate ..... 88. P. hayesii.
66. Leaves auricled on one side ..... 67. P. sperdinum.
Leaves inequilaterally subcordate ..... 71. P. peracuminatum.
67. Petiole glabrous ..... 68.
Petiole subpuberulent ..... 58. P. colonense.
Petiole more or less hairy ..... 69.
68. Leaves acute on one side at base ..... 50. P. subnudibracteum.
Leaves rounded at base ..... 37. P. tecumense.
69. Twigs sparsely subvelvety; leaves oblanceolate ..... 69. P. subdilatatum.
Twigs transiently appressed-hairy ..... 68. P. diazanum.
Twigs crisp-tomentulose ..... 54. P. williamsii.
Twigs crisp-hairy or hirsute ..... 70.
Twigs villous ..... 29. P. culebranum.
70. Twigs glabrescent, green ..... 71.
Pubescence persistent ..... 73.
71. Lower petioles winged ..... 8. P. palmasanum.
Petioles not winged ..... 72.

72. Leaves 8 cm. wide, not caudate ..... **46. P. erectamentum.**
Leaves 7 cm. wide, caudate ..... **49. P. subcaudatum.**
Leaves 5 to 6 cm. wide ..... **42. P. turbense.**
Leaves 4 cm. wide ..... **82. P. taboganum.**
73. Leaves cordulate, rather glossy ..... 74.
Leaves not cordulate, firm, dull ..... 75.
74. Leaves glabrescent between the nerves ..... **28. P. gonocarpum.**
Leaves loosely hairy beneath; spikes very short ..... **30. P. pubistipulum.**
75. Leaves smooth ..... **59. P. panamense.**
Leaves lepidote-roughened; nerves impressed ..... **61. P. killipi.**
76. Leaves about half as broad as long ..... 77.
Leaves more elongate ..... 87.
77. Leaves glandular-granular above ..... **71. P. peracuminatum.**
Leaves scabrous above ..... 78.
Leaves scarcely scabrous ..... 83.
78. Twigs crisp-pubescent ..... 79.
Twigs scabrid-hispid or hirsute ..... 80.
Twigs villous ..... **76. P. villiramulum.**
79. Leaves scarcely 6 by 12 cm ..... **66. P. pseudo-cativalense.**
Leaves becoming 8 by 16 cm ..... **73. P. barbinerve.**
80. Pubescence short-scabrid ..... 81.
Pubescence more upcurved and hirsute ..... 82.
81. Leaves scarcely 6 by 12 cm ..... **66. P. pseudo-cativalense.**
Leaves becoming 9 by 15 cm ..... **64. P. trachydermum.**
82. Leaves pale-granular beneath ..... **74. P. non-retrorsum.**
Leaves not markedly pale-granular beneath ..... **72. P. sancti-felicis.**
83. Plants climbing; leaves very lepidote ..... **83. P. vitabundum.**
Plants not climbing ..... 84.
84. Leaves 10 by 20 cm ..... 85.
Leaves distinctly smaller ..... 86.
85. Leaves not cordulate ..... **26. P. stevensi.**
Leaves unequally cordulate ..... **71. P. peracuminatum.**
86. Pubescence velvety-tomentulose ..... **6. P. bigelovii.**
Pubescence soft, crisp-appressed ..... **70. P. obaldianum.**
Pubescence sparsely villous ..... **65. P. cativalense.**
87. Leaves scabrous above ..... 88.
Leaves scarcely scabrous ..... 96.
88. Spikes hooked ..... **77. P. elongatum.**
Spikes nearly or quite straight ..... 89.
89. Twigs densely red-velvety ..... **86. P. pervelutinum.**
Twigs crisp-pubescent or appressed-pubescent ..... 91.
Twigs hispid-hirsute ..... **61. P. killipi.**
Twigs tomentose or scabrous-hispid ..... 90.
Twigs villous ..... 94.
90. Leaves oblong, 4 by 16 cm ..... **79. P. changuinolanum.**
Leaves obliquely elliptic-ovate, 8 by 18 cm ..... **75. P. scabrilimbum.**
91. Twigs densely canescent upwards ..... **85. P. breve.**
Pubescence more sparse ..... 92.
92. Leaves rough, oblong ..... **85. P. breve.**
Leaves smoother ..... 93.
93. Leaves broadly lance-elliptic ..... **78. P. chagresianum.**
Leaves broadly oblanceolate ..... **69. P. subdilatatum.**
94. Leaves subequilateral, elliptic-oblong ..... 95.
Leaves obliquely ovate-elliptic ..... **76. P. villiramulum.**

95. Leaves scarcely 4 by 12 cm.....56. **P. viridicaule.**
Leaves twice as long, granular.....57. **P. persubulatum.**
96. Leaves scarcely 2 by 10 cm.....81. **P. linearifolium.**
Leaves distinctly larger.....97.
97. Twigs glabrous, granular.....52. **P. storkii.**
Twigs appressed-hispid; plants climbing.....83. **P. vitabundum.**
Twigs sparingly crisp-pubescent or appressed-pubescent or hirsute.....98.
Twigs almost canescent above.....85. **P. breve.**
Twigs villous.....100.
98. Leaves scarcely 5 by 15 cm., the base obtuse.....99.
Leaves 8 by 20 cm., the base subacute.....53. **P. pallidibracteum.**
99. Leaves lanceolate.....80. **P. fatoanum.**
Leaves oblanceolate.....69. **P. subdilatatum.**
100. Spikes short.....101.
Spikes slender and elongate.....87. **P. pilosiusculum.**
101. Leaves granular beneath.....32. **P. garagaranum.**
Leaves not granular.....31. **P. pseudo-garagaranum.**

1. Piper smilacifolium H. B. K. Nov. Gen. & Sp. 1: 56. 1815.

TYPE LOCALITY: Caripe, Venezuela.

RANGE: Venezuela to Panama and Guatemala.

CANAL ZONE: Barro Colorado Island, *Standley* 31267. Caño Quebrado, *Pittier* 6986. Cerro Gordo, Culebra, *Standley* 26008. Fort Sherman, *Standley* 30959; *Stevens* 1066. France Field to Catival, *Standley* 30338. Gamboa to Cruces, *Pittier* 3778. Gatún, *Standley* 27201. Gatuncillo, *Piper* 5603, 5620. Gorgona to Gatún, *Pittier* 2279. Las Cascadas Plantation, *Standley* 25728. Mamei Hill, *Pittier* 3811. Matachín, *Kuntze* 1918. Obispo, *Standley* 31726. Río Agua Salud, Frijoles, *Piper* 5859, 5860. Río Pedro Miguel, East Paraíso, *Standley* 29969. COLÓN: Chagres Mouth, *Stevens* 278. Fató, *Pittier* 3842. Río Fató, *Pittier* 3872, 3882. PANAMA: Río Tecumen, *Standley* 29363. Río Tapia, *Maxon & Harvey* 6650, 6708; *Standley* 26160. 28035, 28241. Juan Díaz, *Standley* 30548. DARIÉN: Sambú River, *Pittier* 5570. BOCAS DEL TORO: Lower Changuinola River, *Stork* 50.

2. Piper san-joseanum C. DC. Linnaea 37: 351. 1872.

Piper marginatum Auct. as to Panama.

TYPE LOCALITY: Mount Aguacate, Costa Rica.

RANGE: Costa Rica and Panama.—One of the continental equivalents of *P. marginatum* of the Antilles, which is quite lacking from the Caribbees.

PROVINCE (?): Santa Rita Trail, *Cowell* 122. VERAGUAS: Isla de Uva, *Pittier* 5112. CANAL ZONE: Agua Clara, *Stevens* 546. Ancón Hill, *Killip* 3041, 12087; *Standley* 26326. Balboa, *Standley* 25600. Cerro Gordo, Culebra, *Pittier* 3737; *Standley* 25964. Culebra, *Pittier* 2146; *Stevens* 927. Darién Station, *Standley* 31557. Fort Clayton to Corozal, *Standley* 29214. Fort Randolph, *Standley* 28655. Las Cruces Trail, *Standley* 29214. Fort Sherman, *Standley* 30942; *Stevens* 267. Frijoles, *Standley* 27627. Frijoles to Monte Lirio, *Killip* 12116. Gamboa, *Standley* 28334, 28536. Gatún, *Standley* 27247, 27288. Corozal, *Stevens* 63, 118. Monkey Hill above Colón, *Lehmann* 768. Juan Mina, *Piper* 5696, 5698. Las Cascadas Plantation, *Standley* 25751. Summit, *Standley* 26938. New Limón, *Stevens* 1015. COLÓN: Fató to Playa de Damas, *Pittier* 3934. Río Chagres, *Piper* 5898, 5917, 5962. Santa Isabel, *Pittier* 4176. PANAMA: Bella Vista, *Killip* 12012; *Standley* 25332. Chepo, *Pittier* 4708. Corozal Road, *Standley* 26834. Camino de la Granja, *Bro. Heriberto* 166. Juan Díaz, *Standley* 30521. Las Sabanas to Matías Hernández, *Standley* 31835. Punta Paitilla, *Standley* 26274. Río Tapia, *Standley* 28207.

Río Tecumen, *Standley* 26599, 29482. Taboga Island, *Killip* 3165, 3195; *Pittier* 3553: *Standley* 27044, 27057, 27847. DARIÉN: Garachiné, *Pittier* 5512.

2a. Piper san-joseanum aristolochiaefolium Trel., var. nov.

A form with more narrowly ovate, dull dark green, bullate leaves 8 to 8.5 by 15 cm., deeply cordate, with parallel margins to the sinus.

Type in the U. S. National Herbarium, no. 1,217,625, collected on hills north of Frijoles, Canal Zone, Panama, by Paul C. Standley (no. 27524).

3. Piper pinoganense Trel., sp. nov.

A shrub; flowering internodes green, much fluted, minutely and very transiently puberulent; leaves elliptic, caudate, rounded at base but sulcately narrowed to the petiole, moderate (4.5–5.5×9–12 cm.), 5-nerved, the nerves salient on both sides, glabrous, very thick and firm, drying green; petiole very short (scarcely 5 mm.), puberulent, winged and deeply channeled; spikes opposite the young leaves, filiform, 4 cm. long, loosely flowered; peduncle scarcely 1 cm. long, slender; bracts minute, concave; flowers sessile, perfect; stigmas 3, minute.

Type in the Delessert Herbarium, Geneva (duplicate in the U. S. National Herbarium), collected at Pinogana, southern Darién, Panama, by H. Pittier (no. 6556).

RANGE: Southeastern Panama.

4. Piper pervenosum C. DC. (Candollea 1: 268, name only. 1923) Schroeder, Candollea 3: 137. 1926.

A shrub; flowering internodes moderately slender but short, gray-tomentulose; leaves broadly ovate, subacute, equally rounded or slightly cordulate at base, rather large (8×14–11×18 cm.), pinnately nerved from below the upper third, the main nerves[1] 3 or 4×2 but with intermediates and spaced shorter veins nearly to the end, glabrous, gray-green, paler beneath; petiole very short (5 mm.), tomentulose-puberulent, winged to the end; spikes terminal or opposite the leaves, small (4×25 mm.); peduncle short (scarcely 10 mm.), gray-tomentulose; bracts lunulate; flowers sessile, perfect; ovary round, with a very short style.

TYPE LOCALITY: Puerto Obaldía, San Blas Coast, Province of Colón (*Pittier* 4302, the type).

RANGE: Northeastern Panama.

5. Piper oblitum Trel., sp. nov.

A small scandent (?) shrub; flowering internodes slender and short, from slightly velvety quickly glabrescent; leaves broadly ovate, very bluntly acuminate, subequally rounded at base, moderately large (6–8×10–13 cm.), submultiple-nerved from the lower fourth, the nerves 4×2, the lower congested, the nerves above sparsely hairy, rusty-tomentulose beneath; petiole rather short (13+2 or 3 mm.) fleecy, winged at base; spikes opposite the leaves, moderate (3×30–40 mm.); peduncle short (5–7 mm.), sparingly hairy; bracts lunulately subpeltate, velvety; flowers sessile, perfect.

Type in the herbarium of the New York Botanical Garden, collected in "Panama" by Sutton Hayes (no. 803).

RANGE: Northeastern (?) Panama.

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[1] Two forms of expression used in this paper in the description of leaves perhaps require explanation. The phrase "main nerves 3 or 4×2" indicates that there are 3 or 4 chief lateral nerves on each side of the costa. The phrase "petiole rather short (13+2 mm.)" indicates that in a leaf with unequal base the blade extends on one side 2 mm. below the apex of the petiole.

6. Piper bigelovii Trel., sp. nov.

A shrub, nodose, rusty-tomentulose or velvety throughout; flowering internodes rather slender and short; leaves elliptic to ovate, subacuminate, rounded or cordulate at base with one side commonly shorter, moderately large (5–7×12–13 cm.), pinnately nerved from below the middle, the nerves 5 or 6×2; petiole rather short (10–10+4 mm.), winged at base; spikes opposite the leaves, moderately elongate (3×60–65 mm.); peduncle short (5–10 mm.); bracts triangular-subpeltate, ciliate; flowers sessile, perfect; berries minute, obpyramidal, 3-sided; stigmas 3, minute, linear, sessile.

Type in the Torrey Herbarium, New York Botanical Garden, collected on the "Isthmus of Panama" by J. N. Bigelow.

RANGE: Panama.

7. Piper paulownifolium C. DC. Anal. Inst. Fís. Geogr. Costa Rica **9**: 173. 1898.

Piper casimirianum Auct. as to Panama.

TYPE LOCALITY: La Palma, Costa Rica.

RANGE: Costa Rica and Panama.

CHIRIQUÍ: Hato de Jobo, San Felix, *Pittier* 5427. Cerro de la Plata, San Felix, *Pittier* 5158. CANAL ZONE: Barro Colorado Island, *Maxon, Harvey & Valentine* 6809; *Standley* 31282, 31893; *Stevens* 645. Caño Quebrado, *Pittier* 6666. Frijoles, *Standley* 27612. Gatún, *Standley* 27226. Gorgona to Gatún, *Pittier* 2261. Mamei Hill, *Pittier* 3812. COLÓN: Fató, *Pittier* 3844, 3862. DARIÉN: Boca de Pauarandó, Sambú River, *Pittier* 5687.

8. Piper palmasanum C. DC. Smiths. Misc. Coll. **71**[6]: 3. 1920.

TYPE LOCALITY: Cuesta de las Palmas, Cerro de la Horqueta, Chiriquí (*Pittier* 3225, the type).

RANGE: Southwestern Panama.

9. Piper dunlapi Trel., sp. nov.

A shrub, glabrous, nodose; flowering internodes rather slender and short, granular, dark in drying; leaves ovate or lance-ovate, more or less sharply acuminate, rather unequally acute to equilaterally rounded at base, moderately small (5–5.5×13 cm.), submultiple-nerved, the midrib on each side with about 5 branches from below the middle or upper third, the lowermost basal, somewhat glandular-granular; petiole short (10–15 mm.), winged at base only or on the larger leaves throughout; spikes opposite the leaves, rather small (3×23 mm.) before flowering, mucronate; peduncle slender and short (scarcely 10 mm.); bracts roundish-subpeltate, brown-umbonate, with broad yellow ciliolate margin; flowers sessile.

Type in the U. S. National Herbarium, no. 1,205,151, collected in Changuinola Valley, Bocas del Toro, Panama, by V. C. Dunlap (no. 231).

RANGE: Northwestern Panama.

10. Piper chiriquinum C. DC. Smiths. Misc. Coll. **71**[6]: 2. 1920.

TYPE LOCALITY: El Boquete, Chiriquí (*Pittier* 2930, the type).

RANGE: Southwestern Panama.

11. Piper pseudo-variabile Trel., sp. nov.

Piper grandifolium Auct. as to Panama.

Piper variabile Auct. as to Panama.

A shrub, glabrous; flowering internodes rather long and slender; leaves elliptic to broadly ovate, acuminate, equilaterally rounded or the larger subtruncate at base, large (7–8×17–13×20 cm.), pinnately to submultiple-nerved from below the upper fourth, the nerves 5 to 7×2 with the lower congested toward the base; petiole relatively short (10–15 mm.), winged toward the base;

spikes opposite the leaves, rather slender and long (3×50–90 mm.); peduncle rather slender and short (18 mm.); bracts inconspicuous, concave; flowers sessile, perfect; berries minute, obpyramidal, 3-sided, glabrous; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 678920, collected on Loma de la Gloria, near Fató, Province of Colón, Panama, by H. Pittier (no. 3845).

RANGE: Panama.

CHIRIQUÍ: San Felix, *Pittier* 5189, 5262. COCLÉ: Ola, *Pittier* 5075. CANAL ZONE: Ancón Hill, *Standley* 25179; *Williams* 19. Barro Colorado Island, *Standley* 31308. Fort Sherman, *Standley* 31022. PANAMA: Juan Díaz, *Standley* 30610.

11a. Piper pseudo-variabile pachypus Trel., var. nov.

Nodose; leaves broadly elliptic, 10.5×20 cm.; spikes 100 mm. long; peduncle stout.

Type in the U. S. National Herbarium, no. 1,167,279, collected between Frijoles and Monte Lirio, Canal Zone, Panama, by E. P. Killip (no. 12145).

RANGE: Central Panama.

11b. Piper pseudo-variabile collium Trel., var, nov.

Leaves becoming elongate, 7 to 8 by 20 to 25 cm.; passing into the type.

Type in the U. S. National Herbarium, no. 1,153,478, collected along the Río Tapia, Province of Panama, Panama, by Paul C. Standley (no. 26130).

RANGE: Central Panama.

CANAL ZONE: Caño Quebrado, *Pittier* 6662. Frijoles, *Standley* 27555. Gatún, *Standley* 27191. Las Cascadas Plantation, *Standley* 25700, 25733, 29518, 29658. Obispo, *Standley* 31702. Río Paraíso, *Standley* 29892. PANAMA: Juan Díaz, *Standley* 30577.

12. Piper crassispicatum Opiz in Presl, Rel. Haenk. 1: 152. 1830.

Artanthe crassispicata Miquel, Syst. Piper. 521. 1844.

TYPE LOCALITY: "Panama."

RANGE: Panama.

13. Piper laxispicum Trel., sp. nov.

A small glabrous soft-wooded shrub scarcely 50 cm. tall; stems slender, green; leaves lanceolate or lance-oblong, subacuminate, equilaterally acute at base, moderately small (4–5×12–16 cm.), pinnately nerved throughout, the nerves about 8×2 with some shorter intermediates, drying green and papery; petiole rather short (10 mm.), not winged; spikes opposite the leaves, in fruit rather thick and short (7×50 mm.); peduncle slender, scarcely 10 mm. long; bracts concave; flowers sessile, perfect; berries not crowded, ellipsoid, mucronate, drying angular; stigmas 3, from the mucro.

Type in the U. S. National Herbarium, no. 1,215,963, collected on Barro Colorado Island, Gatún Lake, Canal Zone, Panama, by Paul C. Standley (no. 31375).

RANGE: East-central Panama.

13a. Piper laxispicum latifolium (C. DC.) Trel.

Piper acuminatissimum latifolium C. DC. in herb.

Leaves broader (6–8×15–17 cm.) and more heavily nerved.

Type in U. S. National Herbarium, no. 679401, collected at Puerto Obaldía, San Blas Coast, Province of Colón, Panama, by H. Pittier (no. 4288).

RANGE: Northeastern Panama.

14. Piper darienense C. DC. in DC. Prodr. 16[1]: 374. 1869.

Piper lanceolatum Auct. as to Panama.

TYPE LOCALITY: "Veraguas" (*Seemann*).

RANGE: South-central Panama.

14a. Piper darienense tricuspe (Miquel) Trel.

Artanthe tricuspis Miquel; Seem. Bot. Voy. Herald 200. *pl. 42.* 1856.

Piper tricuspe C. DC. in DC. Prodr. 16[1]: 263. 1869.

Piper lanceolatum tricuspe C. DC. Candollea 1: 255. 1923. Name only, in index.

TYPE LOCALITY: "Panama" (*Seemann*).

RANGE: Panama to Ecuador.

15. Piper trichopus Trel., sp. nov.

A shrub; flowering internodes slender, rather short (2–3 cm.), sparsely pubescent; leaves lanceolate, almost equally acute at both ends or one side subobtuse at base, moderately small (3–3.5×12–13 cm.), pinnately nerved nearly throughout, the looping nerves about 8×2, appressed-pubescent on the nerves beneath and somewhat granular; petiole rather short (5–10 mm.), very slender, not winged, pubescent; spikes opposite the leaves (2×50 mm.); peduncle extremely slender, 10 to 15 mm. long, short-hairy; bracts inconspicuous, concave, ciliate; flowers perfect, sessile; stigmas 3, minute, sessile; berries subcubical, glabrous.

Type in the Herbarium of Columbia University, New York Botanical Garden, collected in "Panama" by Sutton Hayes (no. 797).

RANGE: Central (?) Panama.

16. Piper acutissimum Trel., sp. nov.

Piper lucaeanum Auct. as to Panama.

A shrub, glabrous, nodose; flowering internodes short (2 cm.) and slender; leaves narrowly lanceolate or lance-oblong, acute at both ends or subacuminate, rather small (2.5–3×10–14 cm.), pinnately nerved nearly throughout, the larger nerves about 6×2, but with ascending nervules upward; petiole rather short (10 mm.), not winged; spikes opposite the leaves, rather small (3×50 mm.), submucronate; peduncle slender and short (scarcely 10 mm.); bracts concavely truncate, ciliate; flowers sessile, perfect; berries depressed-globose, more or less angular from pressure, velvety; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 38081, collected at Chagres, Province of Colón, Panama, by A. Fendler (no. 266).

RANGE: Eastern central Panama.

CANAL ZONE: Barro Colorado Island, *Stevens* 7. Frijoles, *Standley* 27504, 27599.

17. Piper cordulatum C. DC. Journ. Bot. Brit. & For. 4: 217. 1866.

TYPE LOCALITY: Chagres, Province of Colón (*Fendler* 267, the type).

RANGE: Eastern central Panama.

CANAL ZONE: Agua Clara, *Stevens* 580. Barro Colorado Island, *Standley* 31355. Frijoles, *Standley* 27450, 27578. Gatún, *Hayes* "739?". Gorgona to Gatún, *Pittier* 2267. Las Cruces, *Pittier* 26241. Río Paraíso, *Standley* 29905.

17a. Piper cordulatum granulatum Trel., var. nov.

Differs from the type in its very acute-based, granular-roughened leaves.

Type in the U. S. National Herbarium, no. 1,153,882, collected near Frijoles, Canal Zone, Panama, by Paul C. Standley (no. 27587).

RANGE: East-central Panama.

18. Piper falcifolium Trel., sp. nov.

Piper geniculatum Auct. as to Panama.

A shrub, glabrous, nodose; flowering internodes slender and short (2–3 cm.), becoming coarsely warty; leaves falcately lanceolate, acuminate, unequally acute at base with one side appreciably longer and decurrent, moderately small (3–3.5×11–14 cm.), pinnately nerved throughout, the nerves about 10×2 with

short intermediates; petiole rather long (10+5 or even 25 mm.), winged throughout; spikes moderate (3×60 mm.); peduncle filiform, rather short (10 mm.); bracts truncately sublunate, rusty-ciliate; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 715322, collected at San Felix, Chiriquí, Panama, by H. Pittier (no. 5137).

RANGE: Southwestern Panama.

19. Piper laevibracteum Trel., sp. nov.

A shrub, glabrous, nodose; flowering internodes slender and moderately short (2.5–4 cm.), at length warty; leaves lance- or elliptic-oblong, subacuminate, very unequal at base with the longer side acute except on the largest, moderately large (4.5–7×15–22 cm.), pinnately nerved throughout, the nerves about 12×2; petiole short (5+10 mm.), winged throughout; spikes opposite the leaves, moderate (2×60 mm.); peduncle slender and short (10 mm.); bracts truncate-lunulate, microscopically ciliolate; flowers sessile, perfect; stigmas 2 to 4, sessile.

Type in the U. S. National Herbarium, no. 715545, collected on Cerro Vaca, Chiriquí, Panama, by H. Pittier (no. 5324).

RANGE: Southwestern Panama.

CHIRIQUÍ: San Felix, *Pittier* 5131. El Boquete, *Maxon* 5381. El Boquete to Caldera, *Pittier* 3327.

20. Piper subnudispicum Trel., sp. nov.

An essentially glabrous shrub, resembling the preceding; leaves elliptic-oblong, acuminate, unequally obtuse at base, rather large (6–7×16 cm.), drying membranaceous; spikes filiform, 2×80 mm.; peduncle short (5 mm.); bracts very inconspicuous.

Type in the U. S. National Herbarium, no. 679342, collected on Loma de la Gloria, Fató, Province of Colón, Panama, by H. Pittier (no. 4241).

RANGE: East-central Panama.

CANAL ZONE: Barro Colorado Island, *Maxon, Harvey & Valentine* 6813. Fort Sherman, *Standley* 31115. Frijoles, *Killip* 3420; *Standley* 27519.

21. Piper tuberculatum Jacq. Coll. Bot. 5: 7. 1786.

TYPE LOCALITY: "Tropical America" (Venezuela?).

RANGE: Northern South America to Central America.

CANAL ZONE: Balboa, *Standley* 25409, 32117. Empire, *Stevens* 1143. PANAMA: Corozal Road, *Standley* 26781. Juan Díaz, *Standley* 30470. Juan Franco Race Track, Panama, *Standley* 27676. Río Tapia, *Standley* 28280. Tumba Muerta Road, *Standley* 29712. Taboga Island, *Pittier* 3550; *Standley* 27093.

22. Piper calocoma (Miquel) C. DC. in DC. Prodr. 16[1]: 264. 1869.

Artanthe calocoma Miquel in Seem. Bot. Voy. Herald 199. 1856.

TYPE LOCALITY: Darién (*Seemann* 1067, the type).

RANGE: Colombia to south-central Panama.

COCLÉ: Bismarck, above Penonomé, *Williams* 332. DARIÉN: *Seemann* 1067.

23. Piper polyneurum C. DC. (Candollea 1: 270. 1923, name only, in index); Schroeder, Candollea 3: 138. 1926.

A small tree 2 to 4 meters tall, coarsely glandular-granular throughout; flowering internodes moderately stout and long, sparingly tomentulose or glabrate; leaves elliptic-ovate, short-acuminate, subequally cordulate or rounded or exceptionally acute at base, large (9–11×20–23 cm.), pinnately nerved nearly throughout, the nerves about 12×2, appressed-pubescent on the nerves beneath; petiole short (5 mm.) and not winged or on the round-based leaves elongate (20–40 mm.) and winged to the end, glabrate; spikes opposite

the leaves, arched, rather large (5×100 mm.); peduncle thick and short (scarcely 10 mm.), glabrate; bracts large, deltoid-peltate, brown-tomentulose; flowers sessile, perfect; stigmas 3, large, slightly stalked.

TYPE LOCALITY: Cerro de Garagará, Sambú Basin, Darién (*Pittier* 5677, the type).

RANGE: Panama.

CANAL ZONE: Frijoles, *Standley* 27495. Río Indio de Gatún, *Pittier* 2790, 2791.

24. Piper gatunense Trel., sp. nov.

A shrub, 2 to 3 meters tall; flowering internodes finally stout and long, green, from villous glabrescent and glandular-granular; leaves lance-elliptic, short-acuminate and slightly inequilaterally acute at base, or ovate-oblong and equilaterally subtruncate at base, pinnately nerved nearly throughout, the nerves 12 to 15×2, sparsely villous on both sides; petiole short (5–10 mm.) and not winged, or on the broader leaves 3 cm. long, villous; spikes opposite the leaves, arched, large (8×100 mm.); peduncle stout and moderately elongate (20 mm.), from villous glabrescent; bracts triangular-subpeltate, the yellow margin ciliate; flowers sessile, perfect; stigmas 3, sessile; berries oblong.

Type in the Torrey Herbarium, New York Botanical Garden, collected at Gatún, Canal Zone, Panama, by Sutton Hayes (no. 502).

RANGE: East-central Panama.

CANAL ZONE: Frijoles, *Standley* 27465, 27491.

25. Piper ladrillense Trel., sp. nov.

A moderate-sized shrub; flowering internodes rather slender and elongate, not granular, transiently crisp-puberulent; leaves broadly ovate, shortly subacuminate, somewhat inequilaterally rounded at base or the shorter side subacute, large (11×20–22 cm.), pinnately nerved nearly throughout, the nerves 12 to 15×2, sparsely white-crisp-hairy on the nerves beneath and obscurely and finely glandular-granular; petiole moderately short (10+2–15+5 mm.), winged, very sparsely white-hairy or glabrate; spikes opposite the leaves, rather large (before flowering 4×55 mm.); peduncle short (10 mm.), glabrate; bracts round or lunate-subpeltate, the narrow pale margin ciliolate; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 677563, collected along the Río Ladrillo, Chiriquí, Panama, by H. Pittier (no. 3164). The collection has been referred to the glabrous peltate-leaved *P. maxonii*.

RANGE: Southwestern Panama.

26. Piper stevensi Trel., sp. nov.

A shrub; flowering internodes rather stout and long, green, densely crisp-hairy; leaves elliptic, short-acuminate, rounded at base on one side with the other shorter and acute, large (10–11×21–23 cm.), pinnately nerved from below the upper fourth, the nerves about 7×2, rather loosely crisp-pubescent on both faces with the nerves pale-hirsute beneath, scarcely granular; petiole moderately long (20+10 mm.), winged below the middle, crisp-hairy; spikes opposite the leaves, rather large (5×80 mm.); peduncle 2 cm. long, moderately slender, subretrorsely crisp-pubescent; bracts elliptical-subpeltate, pale-margined and ciliate; flowers sessile, perfect; stigmas 3, sessile; berries subglobose-oblong.

Type in the herbarium of the University of Illinois, collected at Frijoles, Canal Zone, Panama, by F. L. Stevens (no. 1247).

RANGE: East-central Panama.

27. Piper latibracteum C. DC. Smiths. Misc. Coll. 71[6]: 5. 1920.

TYPE LOCALITY: Boca de Pauarandó, Sambú River, Darién (*Pittier* 5588).

RANGE: Southeastern Panama.

28. Piper gonocarpum Trel., sp. nov.

A shrub, 2 meters tall; flowering internodes moderately slender and elongate, dingy-tomentulose; leaves lance-elliptic or oblong, somewhat acuminate, rounded at base or subcordulate, with one side slightly shorter, moderate (6.5×17 cm.), pinnately nerved from below the middle, the nerves 5 or 6×2, dull green, glabrous and slightly cellular-pitted above, hirsute on the nerves and paler beneath; petiole rather short (10+2 mm.), deeply concave, winged, tomentulose; spikes opposite the leaves, thick and rather short (8×45 mm.), caudate and sterile at tip; peduncle short (10 mm.), sparsely hairy; bracts broad, concave; flowers sessile, perfect; berries depressed-quadrangular, 2 to 3 mm. in diameter, 4-ridged, obscurely puberulent; stigmas 3, broad, sessile.

Type in the U. S. National Herbarium, no. 1,153,832, collected near Frijoles, Canal Zone, Panama, by Paul C. Standley (no. 27437).

RANGE: East-central Panama.

29. Piper culebranum C. DC. Candollea 1: 121, 243. 1923.

TYPE LOCALITY: Río Culebra, Colón (*Pittier* 4154, the type).

RANGE: East-central Panama.

CANAL ZONE: Fort Randolph, *Standley* 28622, 28667. France Field to Catival, *Standley* 30375. PANAMA: Juan Díaz, *Standley* 30611.

30. Piper pubistipulum C. DC. Smiths. Misc. Coll. 71[6]: 5. 1920.

TYPE LOCALITY: Agua Clara, Gatún, Canal Zone (*Pittier* 2661, the type).

RANGE: East-central Panama.

30a. Piper pubistipulum estylosum Trel., var. nov.

Differing in its sessile stigmas.

Type in the U. S. National Herbarium, no. 1,215,959, collected on Barro Colorado Island, Canal Zone, Panama, by Paul C. Standley (no. 31364).

RANGE: With the type.

31. Piper pseudo-garagaranum Trel., sp. nov.

A shrub, scarcely 2 meters tall; flowering internodes zigzag, rather slender and short, evanescently villous; leaves elliptic-lanceolate, acuminate, inequilaterally rounded at base, moderately large (5.5–7×14–16 cm.), pinnately nerved from below about the middle, the alternate nerves about 4×2, with a few soft appressed long hairs on the dark green upper surface, the nerves villous beneath; petiole short (3+3 mm.), scarcely winged, villous; spikes opposite the leaves, as yet young and small (1×20 mm.), with short (5 mm.), sparsely pubescent peduncle; bracts rounded-subpeltate, the narrow pale margin ciliolate; flowers sessile.

Type in the U. S. National Herbarium, no. 1,215,804, collected on Barro Colorado Island, Canal Zone, Panama, by Paul C. Standley (no. 31409).

RANGE: East-central Panama.

32. Piper garagaranum C. DC. Smiths. Misc. Coll. 71[6]: 15. 1920.

TYPE LOCALITY: Garagará, Sambú Basin, Darién (*Pittier* 5618, the type).

RANGE: Southeastern Panama.

33. Piper magnantherum C. DC. Smiths. Misc. Coll. 71[6]: 16. 1920.

TYPE LOCALITY: Cerro de Garagará, Darién (*Pittier* 5666, the type).

RANGE: Southeastern Panama.

34. Piper wagneri C. DC. in DC. Prodr. 16[1]: 302. 1869.

TYPE LOCALITY: "Chiriquí" (*Wagner*).

RANGE: Southwestern Panama.

34a. Piper wagneri var. **minutispicum** (C. DC.) Trel.

Piper minutispicum C. DC. Smiths. Misc. Coll. **71**[6]: 1. 1920.

TYPE LOCALITY: Sabana Grande, El Salto, above El Boquete, Chiriquí (*Pittier* 3116, the type).

RANGE: Southwestern Panama.

35. Piper amphoricarpum Trel., sp. nov.

A shrub, glabrous; flowering internodes rather slender and short (2–3 cm.); leaves lanceolate, subacuminate, equilaterally long-acute at base, moderately small (3–4×12–14 cm.), pinnately nerved nearly to the end, the nerves about 8×2; petiole short (5 mm.), winged at base; spikes opposite the leaves, small (3–5×12–15 mm.), very blunt; peduncle filiform, short (scarcely 10 mm.); bracts lunulate-subpeltate, golden-ciliate; flowers sessile, perfect; ovary glabrous, granular, flask-shaped, in fruit attenuate into a slender style bearing the 3 stigmas.

Type in the U. S. National Herbarium, no. 1,010,185, collected near El Boquete, Chiriquí, Panama, by E. P. Killip (no. 3611).

RANGE: Southwestern Panama.

36. Piper tenuimucronatum C. DC. Smiths. Misc. Coll. **71**[6]: 12. 1920.

TYPE LOCALITY: Los Siguas Camp, Cerro de la Horqueta, Chiriquí (*Maxon* 5421, the type).

RANGE: Southwestern Panama.

37. Piper tecumense Trel., sp. nov.

A shrub, scarcely 2 meters tall, essentially glabrous; internodes slender and elongate, evanescently velvety at the nodes; leaves lance-ovate to elliptic-ovate, sharply but gradually long-acuminate, rounded at base with one side slightly longer, moderately small (4×11–6×14 cm.), pinnately nerved from below the middle, the nerves about 4×2, looping, very obscurely appressed-pubescent on the nerves beneath or quite glabrescent; petiole very short (scarcely 5+2 mm.), winged at base; stipules and stipular line somewhat pubescent; spikes opposite the leaves, when young rather small (1.5×35 mm.); peduncle filiform, 1 cm. long; bracts rounded-subpeltate, with pale ciliolate margin; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 1,154,367, collected along the Río Tecumen, Province of Panama, Panama, by Paul C. Standley (no. 29358).

RANGE: Eastern Panama.

38. Piper san-lorenzanum Trel., nom. nov.

Artanthe trinervia Miquel; Seem. Bot. Voy. Herald 200. *pl. 41.* 1856.

Piper trinerve C. DC. in DC. Prodr. **16**[1]: 292. 1869. *Not P. trinerve* Vahl, 1804.

TYPE LOCALITY: San Lorenzo, Veraguas (*Seemann* 1217, the type).

RANGE: South-central Panama.

39. Piper subtrinerve Trel., sp. nov.

A shrub, 2 to 3 meters tall, essentially glabrous; flowering internodes very slender, moderately short, finely white-dotted; leaves lanceolate, very gradually attenuate or acuminate, characteristically somewhat unequally acute at base, moderately small (3–4×9–14 cm.), pinnately nerved from below the middle, the nerves about 4×2 with the second pair greatly prolonged, glossy green, obscurely granular beneath; petiole very short (2 mm.), not winged; spikes opposite the leaves, moderate (4×55 mm.); peduncle short (10 mm.), glabrous or sparsely pilose upward; bracts conspicuous, triangular-subpeltate, ciliate; flowers sessile, perfect; berries subprismatic, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 678676, collected on Taboga Island, Panama, by H. Pittier (no. 3618).

RANGE: East-central Panama.

PANAMA: Corozal Road, *Standley* 26854. Juan Díaz, *Standley* 30600. Las Sabanas, *Bro. Celestine* 110. Las Sabanas to Matías Hernández, *Standley* 31836. Punta Paitilla, *Piper* 5410. Río Tecumen, *Standley* 26563. Tumba Muerta Road, *Standley* 29710. Taboga Island, *Standley* 27869.

39a. Piper subtrinerve harveyanum Trel., var. nov.

Differs chiefly in having the spikes more distinctly annulate, with the large triangular pale bracts alternating with the dark ovaries.

Type in the U. S. National Herbarium, no. 1,180,427, collected along the Tapia River, Province of Panama, Panama, by W. R. Maxon and A. D. Harvey (no. 6684).

RANGE: East-central Panama.

PANAMA: Tapia River, *Maxon & Harvey* 6734.

40. Piper hirtellipetiolum C. DC. Smiths. Misc. Coll. 71[6]: 3. 1920.

TYPE LOCALITY: David, Chiriquí (*Pittier* 2832 [not 2932], the type).

RANGE: Southwestern Panama.

41. Piper tapianum Trel., sp. nov.

A shrub, 3 meters tall, nodose; flowering internodes slender, moderately short, at first sparingly villous; leaves lanceolate or lance-elliptic, caudate, slightly inequilaterally acute at base, moderate (5–6.5×15–16 cm.), pinnately nerved from below about the middle, the nerves about 4×2, glossy dark green and glabrous above, paler and with the nerves somewhat upcurved-pubescent beneath; petiole short (about 5 mm.), winged below, hirsute; spikes opposite the leaves, rather slender and short (10 mm.), sparsely hirsute; bracts conspicuous, roundish-subpeltate, very gray-ciliate; flowers sessile, perfect; ovary depressed, glabrous; stigmas 3, filiform, sessile.

Type in the U. S. National Herbarium, no. 1,180,449, collected along the Tapia River, Province of Panama, by W. R. Maxon and A. D. Harvey (no. 6709).

RANGE: East-central Panama.

PANAMA: Río Tapia, *Standley* 26122.

42. Piper turbense Trel., sp. nov.

A shrub; flowering internodes slender and rather short, loosely hairy or glabrate; leaves undulately lance-oblong, acuminate, obliquely rounded at base or with one side shorter and subacute, moderately large (5–5.5×16–20 cm.), pinnately nerved from below the middle, the nerves 4 or 5×2, sparsely villous on the nerves beneath; petiole very short (5, or 4+4 mm.), not winged, somewhat hairy; spikes opposite the leaves, small (3×20 mm.), mucronate; peduncle slender, short (5 mm.), loosely pubescent; bracts inconspicuous, sublunate, ciliolate; flowers sessile, perfect; ovary flask-shaped, attenuate into a style; stigmas 3, large.

Type in the Torrey Herbarium, New York Botanical Garden, collected at Turbo, Colombia, by Schott (no. 3).

RANGE: Western Colombia; and adjacent Colón, Panama (?)

43. Piper davidianum C. DC. Smiths. Misc. Coll. 71[6]: 9. 1920.

TYPE LOCALITY: David, Chiriquí (*Pittier* 2837, the type).

RANGE: Southwestern Panama.

44. Piper callibracteum C. DC. Smiths. Misc. Coll. 71[6]: 13. 1920.

Piper chamissonis rubellibracteum C. DC. Smiths. Misc. Coll. 71[6]: 13. 1920.

?*Piper aequale* Auct. as to Panama.

TYPE LOCALITY: El Boquete, Chiriquí (*Pittier* 2940, the type).

CHIRIQUÍ: El Boquete, *Pittier* 2899, type of *P. chamissonis rubellibracteum*; *Killip* 3549, in part.

RANGE: Southwestern Panama.

45. Piper nitidifolium C. DC. Smiths. Misc. Coll. 71[6]: 14. 1920.

TYPE LOCALITY: El Boquete, Chiriquí (*Maxon* 4943, the type).

RANGE: Southwestern Panama.

46. Piper erectamentum C. DC. Smiths. Misc. Coll. 71[6]: 10. 1920.

TYPE LOCALITY: Cerro de la Horqueta, Chiriquí (*Pittier* 3191, the type).

RANGE: Southwestern Panama.

47. Piper papyraceum Trel., sp. nov.

Piper pseudo-propinquum Auct. as to Panama.

A small, essentially glabrous tree; flowering internodes moderately slender and short, drying green, green-granular; leaves ovate-elliptic, acuminate, subequilaterally acute at base, moderately large (6×14–9×20 cm.), pinnately nerved from below the middle, the nerves 5×2, drying green and papery; petiole rather long (2–3 cm.), winged to above the middle; spikes opposite the leaves, moderate (5×60–80 mm.); peduncle short and thick, more or less velvety; bracts triangular-subpeltate, pale, ciliolate; flowers sessile, perfect; berries ovoid, with a short stout style; stigmas 3, large.

Type in the U. S. National Herbarium, no. 677410, collected at El Boquete, Chiriquí, Panama, by H. Pittier (no. 3023).

RANGE: Southwestern Panama.

48. Piper amphioxys Trel., sp. nov.

A shrub; flowering internodes slender and short, at most very obscurely and transiently puberulent, scarcely granular; leaves elliptic, bluntly acuminate, equilaterally acute at base, rather small (4×10–7.5×15 cm.), submultiple-nerved from below the upper third, the nerves 3 or 4×2 with the lowest pair essentially basal, slightly puberulent on the nerves beneath; petiole very short (5 mm.), channeled, not winged, glabrous; spikes opposite the leaves, slender and moderately elongate (2×50 mm.); peduncle slender, short (5 mm.), glabrous; bracts inconspicuous, round-peltate, ciliolate; flowers sessile, perfect; berries minute, somewhat triquetrously obpyramidal, glabrous; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 679340, collected between Loma de la Gloria and Fató, Province of Colón, Panama, by H. Pittier (no. 4239).

RANGE: East-central Panama.

48a. Piper amphioxys laurifolium Trel., var. nov.

Differs in its narrow leaves (4×9–5×13 cm.), with the second pair of midrib branches opposite and about 1 cm. from the base.

Type in the U. S. National Herbarium, no. 715872, collected at Garagará, Sambú Basin, Darién, Panama, by H. Pittier (no. 5598).

RANGE: Southeastern Panama.

49. Piper subcaudatum Trel., sp. nov.

A shrub, nodose; flowering internodes rather slender and short (2–3 cm.), transiently crisp-hairy below the petioles; leaves obliquely elliptic or elliptic-obovate, subcaudately long-acuminate, subobtuse at the narrowed base, rather large (6–7.5×14–16 cm.), pinnately nerved from below the middle, the nerves 5 or 6×2, more or less appressed-hairy on the nerves beneath; petiole very short (5+3 mm.), somewhat crisp-hairy on the back, not winged; spikes opposite the leaves, as yet very young and small (1×10 mm.); peduncle sparsely velvety; bracts rounded-subpeltate, ciliolate; flowers sessile.

Type in the U. S. National Herbarium, no. 715886, collected at Garagará, Sambú Basin, Darién, Panama, by H. Pittier (no. 5612).

RANGE: Southeastern Panama.

50. Piper subnudibracteum C. DC. Smiths. Misc. Coll. 71[6]: 14. 1920.

TYPE LOCALITY: Cerro Vaca to Hato del Loro, Chiriquí (*Pittier* 5390, the type).

RANGE: Southwestern Panama.

51. Piper sambuanum C. DC. Smiths. Misc. Coll. 71[6]: 13. 1920.

TYPE LOCALITY: Garagará, Sambú Basin, Darién (*Pittier* 5663, the type).

RANGE: Southeastern Panama.

DARIÉN: Garagará, *Pittier* 5726.

52. Piper storkii Trel., sp. nov.

A shrub, essentially glabrous; flowering internodes slender and short, green, granular; leaves lance-elliptic, acuminate, very inequilateral, acute at base or the longer side somewhat rounded, moderate (4×10–6×15 cm.), pinnately nerved from below about the middle, the nerves 4 or 5×2, drying green, rarely with a soft hair above and the nerves very obscurely appressed-pubescent beneath; petiole very short (scarcely 5 mm.), granular, not winged above the base; spikes opposite the leaves, dull red, 2×60 mm.; peduncle very short (5 mm.) and relatively thick; bracts roundish-subpeltate, glabrous; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 1,166,892, collected at Rubber Tree Station, Bocas del Toro, Panama, by H. E. Stork (no. 124).

RANGE: Northwestern Panama.

53. Piper pallidibracteum C. DC. Smiths. Misc. Coll. 71[6]: 8. 1920.

TYPE LOCALITY: Puerto Obaldía, San Blas Coast, Province of Colón (*Pittier* 4396, the type).

RANGE: Northeastern Panama.

54. Piper williamsii Trel., sp. nov.

A shrub, 2 to 3 meters tall, nodose; flowering internodes slender and short (2–3 cm.), grayish-tomentulose; leaves inequilaterally lanceolate or lance-elliptic, acuminate, obliquely rounded at base with one side slightly shorter and more acute, moderately large (5–7×13–17 cm.), pinnately nerved from below the middle or upper third, the nerves 5 or 6×2, cancellate-veiny, lepidote but essentially glabrous above, appressed-tomentulose on the nerves beneath; petiole rather short (10+3 mm.), tomentulose, not winged; spikes opposite the leaves, slender, 2×90 mm., refracted-mucronate; peduncle slender and short (10 mm.), appressed-pubescent or tomentulose; bracts lunately subpeltate, ciliolate; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 678344, collected at Marragantí, Panama, by R. S. Williams (no. 986).

55. Piper lucigaudens C. DC. Smiths. Misc. Coll. 71[6]: 10. 1920.

TYPE LOCALITY: Río Indio de Gatún, Canal Zone (*Pittier* 2791, the type).

RANGE: East-central Panama.

56. Piper viridicaule Trel., sp. nov.

A shrub, 2 meters tall; flowering internodes green, slender and rather elongate, villous; leaves lanceolate, gradually sharp-acuminate, inequilaterally cordulate with the longer side covering the petiole, moderately small (3.5–4×10–12 cm.), pinnately nerved from below about the middle, the nerves about 5×2, green, dull, sparsely villous and very white-scabrous above, paler and appressed-white-hirsute beneath especially on the nerves; petiole moderately short (8+2–20+2 mm.), white-villous, winged below; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,215,801, collected on Barro Colorado Island, Gatún Lake, Canal Zone, Panama, by Paul C. Standley (no. 31402).

RANGE: East-central Panama.

57. **Piper persubulatum** C. DC. Smiths. Misc. Coll. 71[6]: 4. 1920.

TYPE LOCALITY: Loma de la Gloria, Fató, Colón (*Pittier* 4240, the type).

RANGE: East-central Panama.

58. **Piper colonense** C. DC. Smiths. Misc. Coll. 71[6]: 11. 1920.

TYPE LOCALITY: Dos Bocas, Río Fató, Colón (*Pittier* 4221, the type).

RANGE: East-central Panama.

59. **Piper panamense** C. DC. Journ, Bot. Brit. & For. 4: 216. 1866.

Piper citrifolium panamense C. DC. Candollea 1: 114. 1923.

TYPE LOCALITY: Chagres, Province of Colón (*Fendler* 270, the type).

RANGE: Northern Panama.

BOCAS DEL TORO: Laguna de Chiriquí, *Hart* 124.

60. **Piper septuplinervium** (Miquel) C. DC. in DC. Prodr. 16[1]: 313. 1869.

Artanthe septuplinervia Miquel in Seem. Bot. Voy. Herald 199. *pl. 40.* 1856.

TYPE LOCALITY: "Panama" (*Seemann* 1066, the type).

RANGE: Northern (?) Panama.

COLÓN: Porto Bello, *Pittier* 2477.

61. **Piper killipi** Trel., sp. nov.

A shrub; flowering internodes moderately slender and short, dingy-subtomentose; leaves lanceolate, gradually acuminate, obliquely subacute at base, moderately small (4–5×11–15 cm.), pinnately nerved from below the middle, the impressed nerves 5 or 6×2, dull, glabrous and scarcely scabrous above, appressed-hairy on the nerves beneath; petiole very short (5 mm.), crisp-hairy; spikes opposite the leaves, elongate (3×100 mm.), hooked-mucronate; peduncle short (5–10 mm.), glabrate; bracts triangular-subpeltate, ciliate; flowers sessile, perfect; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,012,175, collected near El Boquete, Chiriquí, Panama, by E. P. Killip (no. 3549).

62. **Piper killipi calderanum** Trel., var. nov.

Differs in somewhat larger (5×15 cm.) and rugose, cordulate leaves, and straight-mucronate spikes.

Type in the U. S. National Herbarium, no. 1,266,034, collected along Río Caldera, above El Boquete, Chiriquí, Panama, by E. P. Killip (no. 3544).

RANGE: Southwestern Panama.

63. **Piper infraluteum** Trel., sp. nov.

A shrub, glabrous; flowering internodes slender and short; leaves lance-oblong or ovate-oblong, acuminate, subequally acute at base, small (3–4×10 cm.), pinnately nerved from below the middle, the nerves about 4×2, drying yellow beneath; petiole short (7+2 mm.), not winged; spikes opposite the leaves, slender, 2×50 mm. before flowering; peduncle slender, short (scant 10 mm.); bracts large, round- or triangular-subpeltate, ciliate; flowers sessile, perfect.

Type in the herbarium of the New York Botanical Garden, collected in "Panama" by Sutton Hayes (no. 793).

RANGE: Central (?) Panama.

64. **Piper trachydermum** Trel., sp. nov.

A shrub; flowering internodes slender and rather elongate, scabrid; leaves elliptic-subovate or subobovate, sharp-acuminate, inequilaterally obtuse at base, moderately large (7–8×16 cm.), pinnately nerved from below the upper third,

the nerves about 5×2, microscopically white-scabrous, dingy appressed-pubescent on the nerves beneath; petiole short (7+3 mm.) not winged, hispid; spikes opposite the leaves, slender, 2×50–80 mm. before flowering; peduncle short (5 mm.), scabrid; bracts rounded-subpeltate, rusty-ciliolate; flowers sessile.

Type in the herbarium of the New York Botanical Garden, collected in "Panama" by Sutton Hayes (no. 791).

RANGE: East-central Panama.

PANAMA: Río Tapia, *Standley* 28208. COCLÉ: Bismarck, *Williams* 343.

65. Piper cativalense Trel., sp. nov.

A shrub, 2 to 3 meters tall; flowering internodes slender and elongate, villous; leaves elliptic-ovate or subovate, rather abruptly acuminate, inequilaterally cordulate, moderate (6.5×12–14 cm.), pinnately nerved from below the middle or upper third, the nerves about 5×2, green, rather glossy and sparsely long-hairy above, more villous beneath, especially on the nerves; petiole rather short (scarcely 10+2 mm.), loosely villous, winged below; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,154,579, collected between France Field, Canal Zone and Cativa1, Province of Colón, Panama, by Paul C. Standley (no. 30206).

RANGE: East-central Panama.

66. Piper pseudo-cativalense Trel., sp. nov.

A shrub, 2 meters tall; flowering internodes slender and elongate, green, sparingly crisp-pubescent; leaves elliptic-ovate to oblong, rather bluntly subacuminate, inequilaterally rounded at base or the broader deeply cordulate, moderate (5–6×12–13 cm.), pinnately nerved from below the middle, the nerves 4 or 5×2, dull, crisp-hairy, and very scabrous above, grayer and obscurely granular beneath with the nerves upcurved-pubescent; petiole short (scarcely 10+2 mm.), hispid or matted-hairy, winged below; spikes opposite the leaves, as yet minute and dingy-canescent.

Type in the U. S. National Herbarium, no. 1,215,573, collected between France Field, Canal Zone, and Cativa1, Province of Colón, Panama, by Paul C. Standley (no. 30399).

RANGE: East-central Panama.

CANAL ZONE: Barro Colorado Island, *Standley* 31288, 31387. Mount Hope Cemetery, *Standley*, 28776.

67. Piper sperdinum C. DC. Smiths. Misc. Coll. 71[6]: 1. 1920.

TYPE LOCALITY: Puerto Obaldía, San Blas Coast, Colón (*Pittier* 4348, the type).

RANGE: Northeastern Panama.

COLÓN: Puerto Obaldía, *Pittier* 4301.

68. Piper diazanum Trel., sp. nov.

A shrub, scarcely 2 meters tall; flowering internodes slender, moderately short, green, sparingly appressed-pubescent; leaves lanceolate to subovate or subobovate, gradually acuminate, rounded or subtruncate at base or shallowly subcordate, with one side sometimes shorter, moderately large (3.5–5 or 7×13–16 cm.), pinnately nerved from below the middle, the nerves about 5×2, slightly pubescent on the nerves, yellowish green, the paler lower surface granular-punctate; petiole short (5 or 5+2–10 mm.), loosely crisp-hirsute or subvillous, winged only at base; spikes opposite the leaves, moderate (3×60–90 mm.); peduncle short (5 mm.), with short appressed white hairs or glabrate; bracts rounded-subpeltate, ciliate; flowers sessile, perfect; berries triquetrously oblong; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 863136, collected east of Juan Díaz, Province of Panama, Panama, by E. P. Killip (no. 3114).

RANGE: East-central Panama.

COLÓN: Porto Bello, *Pittier* 2428. CANAL ZONE: Cerro Gordo, Culebra, *Standley* 26006. Fort Sherman, *Standley* 30953, 30974, 30996. Fort San Lorenzo, *Maxon & Valentine* 7012. Las Cascadas Plantation, *Standley* 25798, 29625. Matachín to Las Cascadas, *Cowell* 338. Monte Lirio, *Maxon* 6843. Mount Hope Cemetery, *Standley* 28802. Obispo, *Standley* 31671. Tabernilla, *Pittier* 3828.

69. Piper subdilatatum Trel., sp. nov.

A shrub, scarcely 2 meters tall; flowering internodes rather slender and short, drying dark, at first loosely velvety or crisp-pubescent; leaves oblanceolate-oblong, acuminate, unequally truncate or rounded below or abruptly subacute at the very base, moderately large (8×18–22 cm.), pinnately nerved from below the middle, the nerves 5 or 6×2, scabrid and transiently or obscurely appressed-pubescent above and velvety on the nerves, and somewhat appressed-hairy or loosely velvety beneath; spikes opposite the leaves, as yet young and scarcely 1×10 mm., canescent; flowers sessile.

Type in the U. S. National Herbarium, no. 863177, collected on Taboga Island, Gulf of Panama, Panama, by E. P. Killip (no. 3194).

RANGE: South-central Panama.

PANAMA: Taboga Island, *Standley* 27019, 27920.

70. Piper obaldianum C. DC. Smiths. Misc. Coll. 71[6]: 7. 1920.

TYPE LOCALITY: Puerto Obaldía, San Blas Coast, Colón (*Pittier* 4366, the type).

RANGE: Northeastern Panama.

71. Piper peracuminatum C. DC. Smiths. Misc. Coll. 71[6]: 9. 1920.

TYPE LOCALITY: Dos Bocas, Río Fató, Colón (*Pittier* 4210, the type).

RANGE: East-central Panama.

COLÓN: Chagres, *Fendler* 269. Río Indio de Fató, *Pittier* 4254. "Panama," *Hayes* 771.

72. Piper sancti-felicis Trel., sp. nov.

A shrub; flowering internodes rather slender, elongate, nodose, retrorsely and somewhat hamately gray-hispid; leaves elliptic-oblanceolate or subobovate, gradually acuminate, inequilaterally rounded at base, rather large (8–10×15–20 cm.), pinnately nerved from below the middle, the nerves 6 or 7×2, minutely scabrous on both faces and the nerves hirsute beneath; petiole short (5+4 mm.), not winged, subretrorsely hispid; spikes opposite the leaves, elongate (3×120 mm.); peduncle short (5 mm.), hispid; bracts transversely subpeltate, ciliolate; flowers sessile, perfect; stigmas 3, minute, sessile; berries small, oblong.

Type in the U. S. National Herbarium, no. 715306, collected at San Felix, Chiriquí, Panama, by H. Pittier (no. 5124).

RANGE: Southwestern Panama.

73. Piper barbinerve Trel., sp. nov.

A shrub; flowering internodes moderately slender and elongate, for a time dingy crisp-pubescent; leaves elliptic-lanceolate or oblanceolate, bluntly acuminate, unequally cordulate with the longer side covering the petiole, moderately large (6–7.5×14–16 cm.), pinnately nerved from below the middle, the nerves at first hairy; petiole short (scarcely over 5+5 mm.), winged to the middle, hairy; spikes opposite the leaves, moderate (2×60 mm. before flowering); peduncle slender, short (10 mm.), sparsely velvety; bracts triangular-subpeltate, pale-ciliate; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 679247, collected above Santa Isabel, Culebra River, Province of Colón, Panama, by H. Pittier (no. 4148).

RANGE: Northeastern Panama.

74. Piper non-retrorsum Trel., sp. nov.

A shrub, nodose; flowering internodes rather slender and short, hiruste with upcurved hairs; leaves inequilaterally elliptic-oblanceolate, sharply acuminate, the narrowed base obtuse or with the shorter side acute, moderately large (8–9×18–20 cm.), pinnately nerved from below the upper third, the nerves 6 or 7×2, white-scabrous above, somewhat hairy beneath on the nerves; petiole moderate (10+7 mm.), hairy, not winged; spikes opposite the leaves, elongate (3×135 mm.), mucronate; peduncle short (scarcely 10 mm.), rough with upcurved pubescence; bracts round- or lunulate-subpeltate, pale-ciliolate; flowers sessile, perfect.

Type in the U. S. National Herbarium, no. 677170, collected near Porto Bello, Province of Colón, Panama, by H. Pittier (no. 2429).

RANGE: Northeastern Panama.

CANAL ZONE: Fort Sherman, *Standley* 31121.

75. Piper scabrilimbum C. DC. Candollea 1: 121, 276. 1923.

TYPE LOCALITY: Boca de Pauarandó, Sambú River, Darién (*Pittier* 5584, the type).

RANGE: Southeastern Panama.

76. Piper villiramulum C. DC. Smiths. Misc. Coll. 71[6]: 11. 1920.

TYPE LOCALITY: Loma de la Gloria, Fató, Colón (*Pittier* 4083, the type).

RANGE: East-central Panama.

CANAL ZONE: Ancón, *Bro. Celestine* 32; *Piper* 6028. Balboa, *Standley* 26073, 29267. Bella Vista, *Macbride* 2732. Cerro Gordo, Culebra, *Standley* 26012. El Paraíso, *Pittier* 2534. Empire to Mandinga, *Piper* 5514. Frijoles, *Piper* 5867. Gamboa, *Standley* 28522. Las Cascadas Plantation, *Standley* 25692, 25701. Miraflores to Corozal, *Pittier* 2193. Río Pedro Miguel, East Paraíso, *Standley* 29966. Summit, *Standley* 26937. COLÓN: Fort Lorenzo, Río Chagres, *Piper* 5971. PANAMA: Pacora River, *Killip* 3123. Corozal Road, Panama, *Standley* 26843. Sabana de Juan Corso, Chepo, *Pittier* 4537.

76a. Piper villiramulum gamboanum (C. DC.) Trel.

Piper hispidum gamboanum C. DC. Smiths. Misc. Coll. 71[6]: 12. 1920.

TYPE LOCALITY: Gamboa, Canal Zone (*Pittier* 3410, the type).

RANGE: North- and east-central Panama.

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 234. CANAL ZONE: Corozal, *Stevens* 116, 117, 124. Cerro Gordo, Culebra, *Standley* 25998. Las Cascadas Plantation, *Standley* 29639. Las Cruces Trail, *Standley* 29048, 29199. Obispo, *Standley* 31794. PANAMA: Juan Díaz, *Standley* 30623. Las Sabanas to Matías Hernández, *Standley* 31818. Río Tapia, *Standley* 28134. Río Tecumen, *Standley* 26598. Camino de la Granja, *Bro. Heriberto* 165.

77. Piper elongatum Vahl, Enum. Pl. 1: 312. 1804.

TYPE LOCALITY: Brazil (?).

RANGE: Around the northeastern part of South America and, in similar if separable forms, through Central America into Mexico.

CANAL ZONE: Gatún, *Standley* 27256. Fort Sherman, *Maxon & Valentine* 6992; *Standley* 30941. COLÓN: Fató to Playa de Damas, *Pittier* 3930. Fort Lorenzo, *Piper* 5985. PANAMA: Tapia River, *Maxon & Harvey* 6671. Tumba Muerta Road, *Standley* 29803.

77a. Piper elongatum laevifolium (C. DC.) Trel.

Piper aduncum laevifolium C. DC. Smiths. Misc. Coll. 71[6]: 8. 1920.

TYPE LOCALITY: Porto Bello, Colón (*Pittier* 2438, the type).

RANGE: North-central Panama.

77b. Piper elongatum brachyarthrum Trel., var. nov.

Differs from the type with sparsely soft-pubescent stem in having the latter very hirsute-villous.

Type in the U. S. National Herbarium, no. 675501, collected near El Boquete, Chiriquí, Panama, by William R. Maxon (no. 5139).

RANGE: Panama.

CANAL ZONE: Chiva-Chiva Trail, *Piper* 5749.

78. Piper chagresianum Trel., sp. nov.

Piper aduncum Auct. as to Panama.

A shrub; flowering internodes moderately slender and rather short, sparsely tawny crisp- or velvety-pubescent; leaves lance-oblong or elliptic-oblong, bluntly subacuminate, rounded or subtruncate at base with one side sometimes a little shorter, rather large (5.5–6.5×15–19 cm.), pinnately nerved from below the middle, the nerves 6 or 7×2, somewhat scabrous and hairy on the nerves above, rather sparingly appressed-pubescent beneath; petiole moderately elongate (10–15+5 mm.), winged below the middle, dingy velvety-hirsute; spikes opposite the leaves, straight, moderate (3–4×65–80 mm.); peduncle short (10 mm.), loosely velvety; bracts inconspicuous, lunulate-truncate, ciliate; flowers sessile, perfect, stigmas 2 or 3, linear, sessile; berries minute, trigonously obpyramidal, glabrous.

Type in the U. S. National Herbarium, no. 42617, collected at Chagres, Province of Colón, Panama, by A. Fendler (no. 268).

RANGE: East-central Panama.

COLÓN: Río Indio de Fató, *Pittier* 4271.

79. Piper changuinolanum Trel., sp. nov.

A shrub, scabrous throughout, nodose; internodes short and rather slender, drying sulcate, densely but finely gray-hispid; leaves inequilaterally or subfalcately oblong, acuminate, rounded at base and shorter on one side, rather small (4×15 cm.), pinnately nerved from below about the middle, the nerves about 5×2, the lowest somewhat approximate, slightly rugose, dull, paler and granular-punctulate beneath and appressed-pubescent on the nerves; petiole short (scarcely 5+5 mm.), winged at base, at first appressed-hairy; spikes opposite the leaves, 2 becoming 3×80–100 mm.; peduncle rather short (10 mm.), appressed-hispid; bracts small, round-subpeltate, ciliate; flowers sessile, perfect; berries short-oblong, mostly elongate with the rachis, glabrous; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,205,153, collected in the Changuinola Valley, Bocas del Toro, Panama, by V. C. Dunlap (no. 233).

RANGE: Northwestern Panama.

80. Piper fatoanum C. DC. Smiths. Misc. Coll. 71[6]: 7. 1920.

TYPE LOCALITY: Fató to Playa de Damas, Colón (*Pittier* 3925, the type).

RANGE: East-central Panama.

81. Piper linearifolium C. DC. Linnaea 37: 355. 1872.

TYPE LOCALITY: Hacienda Santa Rosa, Costa Rica.

RANGE: Costa Rica to central Panama.

CHIRIQUÍ: El Boquete, *Maxon* 5140. COLÓN: Río Fató, *Pittier* 3881.

82. Piper taboganum C. DC. Smiths. Misc. Coll. 71[6]: 4. 1920.

TYPE LOCALITY: Taboga Island, Gulf of Panama (*Pittier* 3529, the type).

RANGE: South-central Panama.

83. Piper vitabundum Trel., sp. nov.

Climbing; flowering internodes rather slender and long, sparingly and transiently appressed-hairy; leaves subelliptic, subacute at both ends or the base rather rounded, moderate (4.5×10–12 cm.), pinnately nerved from below the middle, the nerves about 4×2, closely lepidote on both faces, the nerves appressed-pubescent beneath; petiole short (5+3 mm.), sparsely hairy, scarcely winged; spikes opposite the leaves, normally (?) arched, 3×80 mm.; peduncle short (scarcely 10 mm.), glabrate; bracts roundish-subpeltate, the very narrow pale margin ciliolate; flowers perfect, sessile; berries subcubical; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,205,222, collected in the Changuinola Valley, Bocas del Toro, Panama, by V. C. Dunlap (no. 338).

84. Piper reptabundum C. DC. Bot. Gaz. 70: 169. 1920.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica.

RANGE: Costa Rica and adjacent Panama.

BOCAS DEL TORO: Sibubi Falls, *Rowlee* 372.

85. Piper breve C. DC., sp. nov.

A low shrub; flowering internodes slender and short, canescently subappressed-hairy when young; leaves lanceolate or lance-oblong, gradually pointed, rounded at base with one side shorter, moderately small (3–4.5×9–13 cm.), pinnately nerved from below the middle, the nerves about 5×2, softly appressed-pubescent on both faces or becoming slightly scabrid, not rugose; petiole short (3+3 mm.), hairy, winged to the middle, spikes opposite the leaves, relatively rather thick and short (4×45–60 mm.); peduncle rather short (10 mm.), loosely pubescent, bracts lunate- or triangular-subpeltate, ciliate; flowers sessile, perfect; stigmas 3, sessile; berries subglobose, glabrous.

Type in the U. S. National Herbarium, no. 678858, collected between Gamboa and Cruces, Canal Zone, Panama, by H. Pittier (no. 3787).

RANGE: East-central Panama.

CANAL ZONE: Cerro Gordo, Culebra, *Standley* 25975, 26018. Empire to Mandinga, *Piper* 5523. France Field to Cativa1, Colón, *Stevens* 981. COLÓN: Fató to Playa de Damas, *Pittier* 3923. Fort Lorenzo, *Piper* 5944.

85a. Piper breve pallidineurum Trel., var. nov.

A rather larger, more scabridulous-leaved form, with the prominent nerves paler beneath, the spikes scarcely longer than in the type.

Type in the U. S. National Herbarium, no. 1,154,564, collected between France Field, Canal Zone, and Cativa1, Colón, Panama, by Paul C. Standley (no. 30164).

RANGE: East-central Panama.

CANAL ZONE: Ancón Hill, *Killip* 12078; *Standley* 25203, 26382. Brazos Brook, *Stevens* 752. Chiva-Chiva Trail, *Maxon & Harvey* 659. Culebra, *Pittier* 3445; *Stevens* 993. Gamboa, *Standley* 28374, 28481. Juan Mina, *Piper* 5692. Obispo, *Standley* 31764. PANAMA: Chepo, *Pittier* 4539. Juan Franco Race Track, Panama, *Standley* 27713, 27734, 27777. Tumba Muerta Road, Panama, *Standley* 29724. Matías Hernández, *Standley* 28957. Las Sabanas to Matías Hernández, *Standley* 31832. Las Sabanas, *Bro. Celestine* 110. Punta Paitilla, *Standley* 26303; *Stevens* 349.

85b. Piper breve pseudo-dumeticola Trel., nom. nov.

Piper dumeticola panamense C. DC. Smiths, Misc. Coll. 71[6]: 7. 1920.

A form with lance-oblong, rugose, and scabrid leaves, the spikes scarcely 40 mm. long.

TYPE LOCALITY: Olá, Coclé (*Pittier* 5034, the type).

RANGE: East-central Panama.

85c. Piper breve bellae-vistae Trel., var. nov.

A form with lanceolate-oblanceolate leaves 7×16 cm.

Type in the U. S. National Herbarium, no. 1,167,181, collected at Bella Vista, Panama, by E. P. Killip (no. 12045).

RANGE: East-central Panama.

PANAMA: Bella Vista, *Killip* 12004; *Piper* 5331.

85d. Piper breve divaricatum Trel., var. nov.

A spreading form with lance-elliptic or subovate leaves, and spikes becoming 90 cm. long.

Type in the U. S. National Herbarium, no. 1,180,701, collected at Fort Sherman, Canal Zone, Panama, by William R. Maxon and A. T. Valentine (no. 6986).

RANGE: East-central Panama.

CANAL ZONE: Fort Sherman, *Standley* 30918, 30982, 31149.

85e. Piper breve pseudo-fatoanum Trel., var. nov.

A distinct form with narrow leaves 4×15 cm., and elongate spikes 3 to 4 by 90 mm.

Type in the U. S. National Herbarium, no. 678777, collected at Gamboa, Canal Zone, Panama, by H. Pittier (no. 3709).

RANGE: East-central Panama.

CANAL ZONE: Balboa, *Standley* 25420, 25565, 25603. Corozal, *Standley* 27341. Fort Randolph, *Maxon & Harvey* 6504, 6543; *Standley* 28659. Margarita Swamp, *Maxon & Harvey* 7055. PANAMA: Juan Díaz, *Standley* 30637. Río Tecumen, *Standley* 26551, 29451. Tapia River, *Maxon & Harvey* 6620, 6626; *Standley* 28103; *Stevens* 1033.

86. Piper pervelutinum Trel., sp. nov.

A shrub, nodose; flowering internodes short, densely red-velvety; leaves oblong, subacuminate, rounded at base with one side shorter, rather small (5×12–15 cm.), pinnately nerved from above the middle, the nerves 6×2, gradually approximate downward, rugose, glossy and very scabrous above, dull and red-hairy beneath; petiole short (8+2 mm.), not winged, red-hairy; spikes opposite the leaves, while very young 2×15 mm.; peduncle short, velvety; bracts round-subpeltate, ciliate; flowers sessile.

Type in the herbarium of the New York Botanical Garden, collected in "Panama" by Sutton Hayes (no. 796).

RANGE: Panama.

87. Piper pilosiusculum Opiz in Presl, Rel. Haenk. 154. *pl. 29.* 1830.

TYPE LOCALITY: "Panama" (*Haenke*, the type).

RANGE: Panama.

88. Piper hayesii Trel., sp. nov.

A shrub (?), at first densely rusty-tomentose; leaves obliquely ovate, subacuminate, subcordate, peltate, fully 20 by 30 cm., submultiple-nerved from below the middle, the nerves 6 to 8×2, glabrate between the velvety nerves above, velvety between the hairy nerves beneath, very bullately rugose; petiole elongate (fully 7 cm.), rusty-tomentose, winged; spikes large (4×200 mm.);

peduncle moderate (3.5 cm.), puberulent and somewhat rusty-hairy; bracts triangular-subpeltate, hairy; flowers sessile, perfect; ovary round-ovoid; stigmas 3, sessile.

Type in the Torrey Herbarium of the New York Botanical Garden, collected in "Panama" by Sutton Hayes (no. 765).

RANGE: Panama.

89. Piper veraguense C. DC. in DC. Prodr. 16[1]: 294. 1869.

TYPE LOCALITY: "Costa Rica and Veragua" (*Warscewicz*, the type in the Boissier Herbarium).

RANGE: Northwestern (?) Panama.

90. Piper maxonii C. DC. Smiths. Misc. Coll. 71[6]: 16. 1920.

TYPE LOCALITY: El Boquete, Chiriquí (*Maxon* 5050, the type).

RANGE: Southwestern Panama.

CHIRIQUÍ: Río Ladrillo, above El Boquete, *Maxon* 3163, 3164.

91. Piper auritum H. B. K. Nov. Gen. & Sp. 1: 54. 1816.

TYPE LOCALITY: About Jalapa, Veracruz, Mexico.

RANGE: Through Central America to Colombia in a number of scarcely separable forms, the southernmost chiefly of the large-leaved variety *seemannianum* (Miquel) Trel. (*Artanthe seemanniana* Miquel).

PROVINCE (?): *Seemann* 37, 1069. BOCAS DEL TORO: Changuinola Valley, *Dunlap* 403. Laguna de Chiriquí, *Hart* 125, 126. CHIRIQUÍ: San Felix, *Pittier* 5159. CANAL ZONE: Fort Sherman, *Maxon & Valentine* 6983; *Standley* 3093; *Stevens* 263. Gatún, *Standley* 27244; *Stevens* 832. Gorgona to Gatún, *Pittier* 2263. Monkey Hill, *Cowell* 22. Nuevo Limón, *Maxon* 6898. COLÓN: Fató to Playa de Damas, *Pittier* 3933. Porto Bello, *Pittier* 2441. Puerto Obaldía, *Pittier* 4380. Río Fató, *Pittier* 3909. Santa Isabel, *Pittier* 4177. PANAMA: Chepo, *Pittier* 4709. DARIÉN: Boca de Cupe, *Williams* 785.

92. Piper imperiale (Miquel) C. DC. in DC. Prodr. 16[1]: 339. 1869.

Artanthe imperialis Miquel in Seem. Bot. Voy. Herald 198. 1856.

Piper portobellense C. DC. Smiths. Misc. Coll. 71[6]: 6. 1920.

TYPE LOCALITY: Cacagual Island, Darién (*Seemann* 1068, the type).

RANGE: East-central Panama.

CANAL ZONE: Barro Colorado Island, *Standley*, 31273. Frijoles, *Standley* 27441. Frijoles to Monte Lirio, *Killip* 12155. COLÓN: Porto Bello, *Maxon* 5795.

Piper salicinum Opiz (in Presl, Rel. Haenk. 150. 1830), ascribed when published to Mexico and Panama, is clearly labeled at Prague as from the Marianne Islands, and so is to be dismissed definitely from all consideration of the American flora.

4. PEPEROMIA Ruiz & Pav.

KEY TO SPECIES

1. Leaves alternate (the uppermost sometimes subopposite because of shortened internodes) ..... 2.
   Leaves opposite or whorled ..... 41.
2. Leaves, or some of them, obviously peltate; spikes never paniculate ..... 3.
   Leaves not peltate (the margin exceptionally barely crossing the petiole) ..... 7.
3. Stem short and few-leaved ..... 4.
   Stem elongate and leafy ..... 6.

4. Leaves over 10 cm. long ..... 32. P. variegata.
   Leaves 4 to 6 cm. long ..... 5.
5. Leaves round-ovate ..... 3. P. killipi.
   Leaves elliptic-ovate ..... 4. P. hymenodes.
6. Stem stout; spikes large ..... 31. P. cordulata.
   Stem slender; spikes small ..... 30. P. cordulatiformis.
7. Spikes panicled on a scape; leaves large ..... 8.
   Spikes subpanicled on the leafy stem ..... 38. P. oblongibacca.
   Spikes solitary or paired ..... 9.
8. Leaves lanceolate, acute ..... 44. P. mameiana.
   Leaves subobovate, acute ..... 37. P. williamsii.
9. Leaves palmately nerved (the inner nerves exceptionally confluent toward the base) ..... 10.
   Leaves pinnately nerved ..... 30.
10. Leaves appreciably obtuse at base or cordate ..... 11.
    Leaves appreciably acute at base ..... 21.
11. Leaves at most ciliate or obscurely puberulent ..... 12.
    Leaves evidently pubescent; creeping; leaves small ..... 20.
12. Stem short or stout ..... 13.
    Stem elongate and rather slender ..... 16.
13. Leaves few, at end of the stem ..... 14.
    Leaves distributed along the stem ..... 15.
14. Leaves round-ovate ..... 3. P. killipi.
    Leaves elliptic-ovate ..... 4. P. hymenodes.
15. Petiole thick and short ..... 31. P. cordulata.
    Petiole slender and elongate ..... 2. P. brevipeduncula.
16. Leaves 4 to 6 cm. long; plant prostrate or pendent ..... 17.
    Leaves scarcely half as long ..... 19.
17. Leaves round, cordate ..... 30. P. cordulatiformis.
    Leaves oblong, not cordate ..... 18.
18. Spikes opposite the leaves ..... 25. P. portobellensis.
    Spikes axillary ..... 26. P. elata.
19. Plant creeping; leaves obovate ..... 15. P. panamensis.
    Plant erect; leaves round-ovate ..... 1. P. pellucida.
20. Leaves ovate ..... 29. P. urocarpoides.
    Leaves round-subcordate ..... 28. P. scandens.
    Leaves round-subobovate ..... 13. P. rotundifolia.
21. Leaves at most ciliate or obscurely puberulent ..... 22.
    Leaves evidently pubescent ..... 24. P. obscurifolia.
22. Leaves granular-punctulate ..... 23.
    Leaves not granular ..... 28.
23. Leaves 4 to 6 cm. long ..... 24.
    Leaves 2.5 to 4 cm. long ..... 27.
    Leaves scarcely 2 cm. long, black-granular ..... 21. P. fusco-ciliata.
24. Leaves lanceolate ..... 25.
    Leaves lance-elliptic ..... 26.
25. Leaves merely acute at base ..... 17. P. parietariaefolia.
    Leaves long-cuneate ..... 22. P. percuneata.
26. Stem slender ..... 18. P. conjungens.
    Stem rather stout ..... 27. P. pascuicola.
27. Leaves pale-granular ..... 19. P. leucosticta.
    Leaves black-granular ..... 20. P. leucandra.

28. Leaves 4 to 6 cm. long ..... 29.
Leaves 1 to 4 cm. long ..... 14. P. hygrophiloides.
29. Spikes opposite the leaves ..... 25. P. portobellensis.
Spikes axillary ..... 26. P. elata.
30. Leaves appreciably obtuse at base or cordate ..... 31.
Leaves appreciably acute at base ..... 36.
31. Plants glabrous; leaves round-ovate ..... 1. P. pellucida.
Plants locally pubescent, usually; leaves elongate ..... 32.
32. Leaves 8 to 14 cm. long, velvety ..... 40. P. ciliolibractea.
Leaves 3 to 7 cm. long ..... 33.
33. Plants densely velvety ..... 16. P. stevensi.
Plants distinctly silky-pubescent ..... 24. P. obscurifolia.
Pubescence transient ..... 34.
34. Leaves drying thick; peduncle elongate ..... 39. P. piperorum.
Leaves drying thin ..... 35.
35. Peduncle elongate ..... 41. P. caudulilimba.
Peduncle very short ..... 43. P. gatunensis.
36. Leaves at most ciliate or obscurely puberulent ..... 37.
Leaves evidently pubescent ..... 40.
37. Leaves 12 to 20 cm. long or more ..... 35. P. flavispica.
Leaves 6 to 10 or 12 cm. long ..... 38.
Leaves 4 to 6 cm. long ..... 39.
Leaves scarcely 4 by 4 cm ..... 33. P. machaerodonta.
38. Leaves sharply acuminate ..... 36. P. acuminatifolia.
Leaves blunt ..... 34. P. dodecatheontophylla.
39. Leaves drying thick, subsessile ..... 39. P. piperorum.
Leaves drying thin, slender-petioled ..... 41. P. caudulilimba.
40. Petiole elongate ..... 41. P. caudulilimba.
Petiole very short ..... 42. P. cylindribacca.
41. Leaves lanceolate or lance-elliptic ..... 42.
Leaves round-obovate, whorled, small 45
Leaves round, opposite, small ..... 5. P. cyclophylla.
Leaves oblong, whorled, minute ..... 12. P. apoda.
42. Leaves 6 to 10 cm. long ..... 10. P. seemanniana.
Leaves 4 to 6 cm. long ..... 9. P. viridispica.
Leaves scarcely 4 cm. long ..... 43.
43. Stem stout ..... 8. P. sarcocarpa.
Stem slender ..... 44.
44. Leaves all opposite ..... 11. P. glabrior.
Leaves alternate on stem ..... 23. P. allagotacta.
45. Plant glabrous ..... 6. P. subquadrifolia.
Plant pubescent ..... 7. P. quaternata.

1. **Peperomia pellucida** (L.) H. B. K. Nov. Gen. & Sp. 1: 64. 1815.

Piper pellucidum L. Sp. Pl. 30. 1753.

PANAMA: Without locality, *Seemann* 113; *Hayes* 195. Las Sabanas, *Standley* 25950. Taboga Island, *Standley* 27063, 27881. Chepo, *Pittier* 4450. COLÓN: Chagres, *Fendler* 302. Porto Bello, *Pittier* 2469. Puerto Obaldía, *Pittier* 4370. BOCAS DEL TORO: Changuinola River, *Stork* 1. CANAL ZONE: Summit, *Standley* 26905; *Stevens* 325. Balboa, *Standley* 25827, 27159; *Mrs. Foster* in 1924. Ancón Hill, *Pittier* 3962; *Stevens* 794.

A common weed through the West Indies (the type apparently from Martinique), Mexico, Central America, and northern South America, and introduced into tropical Africa. The continental plant usually has the leaves whitened

beneath and often smaller, var. *pygmaea* Kunth (Syn. Pl. Aequin. 1: 117. 1822, the type from Loxa) and its f. *minor* Van Heurck & Muell. (Obs. Bot. 115. 1870, the type from Panama).

2. Peperomia brevipeduncula (C. DC.) Trel.

Peperomia heydei γ brevipeduncula C. DC. Ann. Cons. Jard. Bot. Genève 21: 274. 1920.

A rather small, simple, erect, glabrous herb, perennial from a rhizome; stem scarcely 10 cm. high, with short internodes; leaves few (scarcely 10), alternate, round or round-ovate or elliptic-ovate, rounded or barely subacute at apex, cordulate, moderate (4 to 7 cm. long and wide), drying dark green, dull and thin, 5 or 7 nerved; petiole 2 to 5 cm. long; spikes several, clustered at the end, comparatively stout and short (scarcely 2–3×80–150 mm.), rather closely flowered above; peduncle almost suppressed; bracts round-peltate; berries blackening, globose; stigma apical, sessile.

TYPE LOCALITY: Santa Marta, Colombia.

DARIÉN: Boca de Pauarandó, Sambú River, *Pittier* 5590.

RANGE: Eastern Panama and adjacent Colombia.

3. Peperomia killipi Trel. Bot. Gaz. 73: 143. 1922.

COLÓN: Alhajuela, *Killip* 3218. Alhajuela to El Vigía, *Pittier* 4712. CANAL ZONE: Río Paraíso, East Paraíso, *Standley* 29890.

4. Peperomia hymenodes Trel., sp. nov.

A small, nearly glabrous herb; stem short and subrhizomatous, with very short internodes; leaves alternate, almost radical, elliptic-ovate, somewhat acute, cordulate to subacute at base, moderate or rather small (2×4–5 or 3.5×6 cm.), ciliate and more or less minutely pubescent near the base, drying very thin and membranaceous, 7-nerved; petiole very slender, 2 to 5 cm. long; spikes scapose, slender and elongate (1×80 mm.), rather closely flowered, the flowers separated by anastomosing papillate ridges; peduncle 3 to 5 cm. long; bracts round-peltate; berries globose; stigma subapical.

Type in the U. S. National Herbarium, no. 715477, collected near San Felix, Chiriquí, Panama, by H. Pittier (no. 5266).

RANGE: Southwestern Panama.

5. Peperomia cyclophylla Miquel in Mart. Fl. Bras. 4¹: 219. 1852.

CANAL ZONE: Gorgona, *Seemann* 607, the type; *Wagner*. Gatuncillo, *Piper* 5652. East Paraíso, *Standley* 29987. CHIRIQUÍ; Puerto Remedios, *Pittier* 3381. Chorrera, *Killip* 3408. PANAMA: Río Tecumen, *Standley* 26542. Matías Hernández to Juan Díaz, *Standley* 31938. Río Tapia, *Standley* 26195, 30670.

6. Peperomia subquadrifolia Trel., sp. nov.

Peperomia quadrifolia Auct. as to Panama.

A small, essentially glabrous, arboricolous mountain herb; stem slender, rooting from many nodes, repeatedly forking; leaves 3 to 7, commonly 4, at a node, obovate or oblong-obovate, revolutely emarginate and slightly hairy in the notch, subacute at base, minute or small (5×8–7×14 mm.), drying opaque and often pale, scarcely nerved; petiole very short (1–2 mm.); spikes terminal, small (25 mm. long), rather closely flowered; peduncle slender, 10 to 15 mm. long; bracts round-peltate, slender, 10 to 15 mm. long; berries ovoid, with slender abrupt style and viscid pseudocupule; stigma apical.

Type in the U. S. National Herbarium, no. 677591, collected at Los Siguas Camp, Cerro de la Horqueta, Chiriquí, Panama, by H. Pittier (no. 3197).

CHIRIQUÍ: Without locality, *Wagner*. Cerro de la Horqueta, *Maxon* 5298, 5539. El Boquete, *Killip* 3534; *Maxon* 5013.

7. Peperomia quaternata Miquel in Seem. Bot. Voy. Herald 197. 1854.

CHIRIQUÍ: *Wagner* 302, in part. Volcano of Chiriquí, *Seemann* 895.

RANGE: Panama and adjacent South America.

8. Peperomia sarcocarpa Trel., sp. nov.

A moderately large, glabrous, assurgent herb, drying greenish, on rocks; stem moderately stout (3 to 6 or 8 mm.), rooting from the lower or even the upper nodes; leaves opposite, rhombic-obovate or rhombic-oblanceolate, conspicuously blunt-acuminate, subcuneate, moderately small (1.5×2.5–2×3–4 or 5 cm.), drying coriaceous, indistinctly 3 or 5-nerved; petiole scarcely over 2 mm. or on the lower leaves 10 to 20 mm. long; spikes terminal, slender and moderately elongate (2×70 mm.), rather loosely flowered; peduncle as thick as the rachis, 2 cm. long; bracts elliptic-peltate; berries globose, red, and succulent; stigma apical.

Type in the herbarium of the New York Botanical Garden, collected near Penonomé, Province of Coclé, Panama, by R. S. Williams (no. 382).

RANGE: South-central Panama.

9. Peperomia viridispica Trel., sp. nov.

A rather large, glabrous, pendent, succulent, epiphytic herb; stem rather thick (3–5 mm.); leaves opposite or exceptionally 3 at a node, subrhombically lanceolate or oblanceolate, blunt-acuminate, subcuneate, rather large (1.5×3.5, 2×4.5–3×6.5 cm.), drying rather thick and opaque, indistinctly about 5-nerved; petiole 5 to 10 mm. long, winged; spikes terminal and occasionally axillary, filiform (scarcely 2×70–100 mm.), loosely flowered, green; peduncle 1 to 2.5 cm. long; bracts subelliptic-peltate; ovary ovoid, attenuate upward; stigma apical.

Type in the U. S. National Herbarium, no. 1,154,147, collected at Balboa, Canal Zone, Panama, by Paul C. Standley (no. 28550).

CANAL ZONE: Balboa, *Standley* 27117, 28568. PANAMA: Tumba Muerta, *Standley* 29827. Las Sabanas to Matías Hernández, *Standley* 31893.

RANGE: Central Panama.

9a. Peperomia viridispica perejil Trel., var. nov.

Erect, 60 cm. tall; leaves more commonly 3, exceptionally 4, at a node, blunter-pointed.

Type in the U. S. National Herbarium, no. 1,153,969, collected on Taboga Island, Panama, by Paul C. Standley (no. 27893).

PANAMA: Taboga Island, *Macbride* 2808.

RANGE: Southern Panama.

10. Peperomia seemanniana Miquel in Seem. Bot. Voy. Herald 198. *pl. 37.* 1854.

CHIRIQUÍ: Volcano of Chiriquí, *Seemann* 896. Cerro de la Horqueta, *Pittier* 3269. El Boquete, *Pittier* 2921; *Maxon* 5037; *Killip* 3542.

11. Peperomia glabrior (C. DC.) Trel., sp. nov.

Peperomia palmana glabrior C. DC. Candollea 1: 304. 1923.

An erect herb of the aspect of *P. palmana;* leaves somewhat larger (1.5–2×3–5 cm.), glabrous; spikes larger (2×40 mm.).

Type in the U. S. National Herbarium, no. 675770, collected on Cerro de la Horqueta, Chiriquí, Panama, by William R. Maxon (no. 5401).

CHIRIQUÍ: Cerro de la Horqueta, *Maxon* 5541, 5553; *Pittier* 3217. El Boquete, *Killip* 3519.

RANGE: Southwestern Panama.

12. Peperomia apoda Trel., sp. nov.

A small stoloniferous mountain herb; stem slender (1–2 mm.), rooting from the lower nodes, minutely but densely puberulous; leaves 2 to 4 at a node,

oblong, rounded at both ends, sometimes emarginulate, minute (2×10 mm.), somewhat pale-granular beneath, glabrous, 1-nerved; petiole almost suppressed; spikes terminal and from the upper axils, filiform (1×20–35 mm.), rather loosely flowered; peduncle nearly suppressed (1–2 mm.); bracts round-peltate; ovary ovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,266,031, collected in valley of Río Caldera, Chiriquí, Panama, by E. P. Killip (no. 3514).

RANGE: Southwestern Panama.

13. Peperomia rotundifolia (L.) H. B. K. Nov. Gen. & Sp. 1: 65. 1816.

Piper rotundifolium L. Sp. Pl. 30. 1753.

COLÓN: Río Fató, *Pittier* 3888. CANAL ZONE: Frijoles, *Pittier* 3759.

A wide-spread species, the prototype from Martinique, ranging from the Antilles to and well into South America in puzzling forms with leaves either orbicular or obovate.

14. Peperomia hygrophiloides C. DC. Candollea 1: 329, 392. 1923.

CHIRIQUÍ: Cerro de la Horqueta, *Pittier* 3205, "3203." Río Caldera, *Killip* 3564.

15. Peperomia panamensis C. DC. Candollea 1: 329, 401. 1923.

CANAL ZONE: Río Indio de Gatún, *Pittier* 2789.

16. Peperomia stevensi Trel., sp. nov.

A small, densely velvety, assurgent herb in tree tops; stem short, with short internodes; leaves alternate, clustered at end of the stem, elliptic or elliptic-ovate, subacute to acuminate, cordulate, rather small (2.5–3×4–6 cm.), paler beneath, drying green, submultiple-nerved from below the upper third, the branches of the midrib about 5×2; petiole 1.5 to 3 cm. long; spikes terminal, moderately large (2×60–70 mm.), closely flowered; peduncle 10 to 15 mm. long; bracts round-peltate, drying thin and light yellow; berries globose, obliquely subtruncate; stigma anterior.

Type in the herbarium of the University of Illinois, collected at Frijoles, Canal Zone, Panama, by F. L. Stevens (no. 1247).

RANGE: Central Panama.

17. Peperomia parietariaefolia Trel., sp. nov.

A rather large, forking, glabrous herb; stem slender (1 mm.), or stout (5 mm.) below; leaves alternate, lanceolate, acuminate, typically acute at base, moderate (1.5–2.5×4–6 cm.), conspicuously 5-nerved, brown-granular beneath; petiole about 5 mm. long; spikes axillary, as yet immature and very small, with short peduncle; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,266,032, collected in valley of the Río Caldera, between El Boquete and the cordillera, Chiriquí, Panama, by E. P. Killip (no. 3520).

RANGE: Southwestern Panama.

18. Peperomia conjungens Trel., sp. nov.

A moderate-sized, repent-assurgent, merely ciliate, black or brown-punctulate herb; stem slender (1–2 mm.), ciliate-lined below the petiole margins, rooting from the nodes; leaves alternate, lanceolate to subrhombic-elliptic, acute or somewhat blunt-acuminate, rather acute at base, moderate (1.5×3, 2×4–6, or 2.5×6 cm.), 5 or 7-nerved, rather firm; petiole 5 to 10 or 15 mm. long, coarsely ciliate; spikes terminal or also from the uppermost axil, rather small (as yet scarcely 2×50 mm.), becoming loosely flowered; peduncle 5 mm. long; bracts round-peltate; ovary ovoid; stigma oblique.

Type in the U. S. National Herbarium, no. 1,215,950, collected on Barro Colorado Island in Gatún Lake, Canal Zone, Panama, by Paul C. Standley (no. 31342).

CANAL ZONE: Las Cascadas Plantation, *Standley* 25730, 29652. Frijoles, *Standley* 27411, in part.

RANGE: Central Panama.

19. Peperomia leucosticta Trel., sp. nov.

A rather small, assurgent, glabrous herb; stem slender (2 mm.), rooting from the lower nodes; leaves alternate, broadly rhombic, rhombic-lanceolate or oblanceolate, or obovate, blunt-acuminate, acute-based, rather small (1.5–2×2.5–3.5 cm.), somewhat paler-granular beneath, 5-nerved; petiole 10 mm. long, decurrent; spikes terminal and axillary, rather slender and elongate (scarcely 2×60 mm.), remotely flowered, the flowers in fusiform pits separated by broad flat anastomosing ridges; peduncle filiform, 10 to 15 mm. long; bracts small, round-peltate; ovary ovoid-pointed; stigma anterior.

Type in the herbarium of the New York Botanical Garden, collected in Panama by Sutton Hayes (no. 811).

20. Peperomia leucandra Trel., sp. nov.

Peperomia glabella Auct. in part as to Panama.

A rather small, repent or assurgent, black-punctulate herb; stem slender (about 1 mm.), occasionally slightly ciliate below the petiole margins, rooting from the nodes; leaves alternate, elliptic or lance-elliptic, more or less acuminate, acute-based, rather small (1.5–2×2.5–4.5 cm.), somewhat ciliate above, 5-nerved; petiole filiform, 5 mm. long, sometimes ciliate; spikes terminal and axillary, rather slender and elongate (1.5×50 mm.), moderately closely flowered; peduncle 5 mm. long; bracts roundish-peltate; anthers often drying white (as in some other species) in contrast with the dark bracts; ovary ovoid, acuminate; stigma oblique.

Type in the U. S. National Herbarium, no. 715329, collected at San Felix, Chiriquí, Panama, by H. Pittier (no. 5143).

RANGE: Southwestern Panama.

21. Peperomia fusco-ciliata Trel., sp. nov.

A delicate black-punctulate repent herb; stem slender (1–2 mm.), rusty-ciliate below the petiole margins, rooting from the nodes; leaves alternate, ovate, acute, rounded or subacute at base, minute as represented (scarcely 7×11 mm.), 3-nerved, ciliate upward; petiole 5 mm. long, rusty-ciliate; spikes terminal and axillary, loosely flowered, small (when partly in flower 1×7 mm.); peduncle scarcely 5 mm. long; bracts round-peltate, black; ovaries ovoid, sunken in the rachis; stigma anterior.

Type in the herbarium of the New York Botanical Garden, collected in Panama, 1859–60, by Sutton Hayes (no. 519).

RANGE: Panama.

22. Peperomia percuneata Trel., sp. nov.

A rather small, prostrate or stoloniferous, black-punctulate herb; stem slender (1–2 mm.), sometimes slightly ciliate below the petiole margins, rooting from the nodes; leaves alternate, rhombic-lanceolate or oblanceolate, acute or somewhat blunt-acuminate, cuneate, moderate or rather small (1×3–1.5×5 cm.), 3 or 5-nerved; petiole filiform, about 5 mm. long, occasionally ciliate; spikes terminal, filiform (1×90 mm.), at length rather loosely flowered; peduncle 5 mm. long; bracts round-peltate; ovary ovoid; stigma oblique.

Type in the U. S. National Herbarium, no. 715426, collected along the Río Dupí, Chiriquí, Panama, by H. Pittier (no. 5224).

RANGE: Southwestern Panama.

23. Peperomia allagotacta C. DC. Candollea 1: 317, 378. 1923.
CHIRIQUÍ: El Potrero, Chiriquí Volcano, *Pittier* 3108. Cerro de la Horqueta, *Killip* 3531.

24. Peperomia obscurifolia C. DC. Candollea 1: 357, 400. 1923.
CANAL ZONE: Agua Clara, Trinidad River, *Pittier* 3982. Barro Colorado Island, *Standley* 31333. Las Cascadas Plantation, *Standley* 25726.
RANGE: Panama.

24a. Peperomia obscurifolia fatoana (C. DC.) Trel.
Peperomia fatoana C. DC. Candollea 1: 357, 387. 1923.
A small, softly white-hairy, epiphytic herb; stem rather slender (2 mm.), rooting from the nodes; leaves alternate, but the uppermost congested, lance-elliptic, acute at both ends, rather small (1×3 to scarcely 1.5×3.5 cm.), 5-nerved with the inner laterals from above the base, ciliolate upward, yellowing and sparsely hairy on the nerves beneath; petiole very short (3 mm.); spikes axillary and terminal, filiform and elongate (1×100 mm.); peduncle filiform, elongate (2–3 cm.), hairy; bracts round-obovate, peltate; berries globose, obliquely mucronulate; stigma subapical.
COLÓN: Río Fató, *Pittier* 3902. CANAL ZONE: Agua Clara, *Pittier* 3983.
RANGE: Central Panama.

24b. Peperomia obscurifolia minor Trel., var. nov.
A reduced form of the Canal Zone.
Type in the herbarium of the New York Botanical Garden, collected between Matachín and Las Cascadas, Canal Zone, Panama, by J. F. Cowell (no. 336).
CANAL ZONE: Trinidad River, *Pittier* 3983.

25. Peperomia portobellensis Beurl. Svensk. Vet. Akad. Handl. **1854**: 147. 1856.
COLÓN: Porto Bello, *Billberg*.

26. Peperomia elata C. DC. Candollea 1: 355, 386. 1923.
CHIRIQUÍ: El Boquete, *Maxon* 5582.

27. Peperomia pascuicola C. DC. Candollea 1: 352, 402. 1923.
CHIRIQUÍ: El Boquete, *Pittier* 2915a; *Killip* 3547.

28. Peperomia scandens Ruiz & Pavón, Fl. Peruv. 1: 32. *pl. 51, b.* 1798.
CANAL ZONE: Río Indio de Gatún, *Maxon* 4857.
Wide-spread from Peru, the type locality, to Nicaragua on the continent, and through the West Indies. A probably divisible species, of many synonyms.

29. Peperomia urocarpoides C. DC. Candollea 1: 362, 414. 1923.
DARIÉN: Cerro de Garagará, Sambú Basin, *Pittier* 5670.

30. Peperomia cordulatiformis Trel. Bot. Gaz. **73**: 143. *f. 19.* 1922.
CANAL ZONE: Mamei Hill, *Pittier* 3806, 3467.

31. Peperomia cordulata C. DC. Journ. Bot. Brit. & For. **4**: 137. 1866.
COLÓN: Chagres, *Fendler* 265.

32. Peperomia variegata Ruiz & Pavón, Fl. Peruv. 1: 33. *pl. 52, f. a.* 1798.
CHIRIQUÍ: El Boquete, *Pittier* 2984.
A Peruvian species; rarely found in Central America.

33. Peperomia machaerodonta Trel., sp. nov.
A rather small, suberect, arboricolous, glabrate herb; stem moderate (3 mm.); leaves alternate, round-elliptic, obtuse or abruptly short-acuminate, rounded or acute at base, rather small (2.5×3.5–3×4 cm.), drying coriaceous but greenish, multiple-nerved, the basal nerves and branches of the midrib 2×2 each, appressed-puberulent beneath, especially on the nerves; petiole

about 5 mm. long, winged; spikes terminal, rather thick and elongate (2×70 mm.); peduncle 2.5 cm. long; bracts round-peltate, about 9 in a whorl; berries ellipsoid, with an equilong, slightly curved, strong beak, at first in ellipsoid pits separated by narrow anastomosing ridges; stigma anterior, at base of the beak.

Type in the U. S. National Herbarium, no. 1,266,033, collected in the valley of Rio Piarnasta, east of El Boquete, Chiriqui, Panama by E. P. Killip (no. 3528).

RANGE: Southwestern Panama.

34. Peperomia dodecatheontophylla Trel., sp. nov.

A rather small, glabrous, epiphytic herb; stem moderate (3 mm.), rooting from the lower nodes; leaves alternate, elliptic-subobovate, subacute, acute at base, rather large (3.5×7.5 to usually 5.5–6×11–12 cm.), fleshy, drying dull, chartaceous, and wrinkled beneath, obscurely pinnately veined to the middle, the branches of the midrib about 4×2; petiole 2.4 to 3.5 cm. long, winged above the middle; spikes axillary or terminal, 1 or 2 on a rather persistently 1 or 2 bracted stalk, rather slender and elongate (2–3×70–100 mm.); peduncle rather long (4–5 cm.); bracts round-peltate; berries oblong-fusiform, the conical beak filiform-attenuate.

Type in the U. S. National Herbarium, no. 677275, collected along Río Indio de Gatún, Canal Zone, Panama, by H. Pittier (no. 2800).

COLÓN: Río Indio de Fató, *Pittier* 4263.

RANGE: East-central Panama.

35. Peperomia flavispica Trel., sp. nov.

A rather large, glabrous, arboricolous herb; stem stout (5–10 mm.), rooting from the nodes, with very short, erect, leafy branches; leaves alternate, elliptic-subobovate, subacute, acuminately attenuate at base, large (6×12–10×20 cm. or more), fleshy, drying rather glossy, coriaceous, and wrinkled beneath, obscurely pinnate-veined to beyond the middle, the delicate branches of the midrib about 6×2; petiole 5 to 12 cm. long, winged upward; spikes axillary (?) or terminal, slender and long (scarcely 3×100 mm. or more), yellow; peduncle rather short (2–3 cm.), red; bracts round-peltate, small, about a dozen to the pseudo-whorl; ovary oblong, slender-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium no. 1,153,501, collected along the Río Tapia, Province of Panama, Panama, by Paul C. Standley (no. 26196).

CANAL ZONE: Las Cascadas Plantation, *Standley* 25729.

RANGE: Central Panama.

36. Peperomia acuminatifolia Trel., sp. nov.

An assurgent (?), essentially glabrous herb; stem succulent, rather stout (3–4 mm.); leaves alternate, oblanceolate-obovate, sharply acuminate, subcuneate from about the middle, rather large (about 4×9 cm.), drying rather coriaceous, very indistinctly pinnate-veined below about the middle, the delicate branches of the midrib about 5×2, sparingly ciliolate; petiole 1 to 2 cm. long, winged; spikes terminal, moderately thick and elongate (3×75 mm.), subacute; peduncle 2 cm. long; bracts round-peltate.

Type in the herbarium of Columbia College, New York Botanical Garden, collected in Panama by Sutton Hayes (no. 817).

RANGE: Panama.

37. Peperomia williamsii Trel., sp. nov.

A glabrous, subsimple, rather large, succulent herb growing on trees; stems stout (nearly 1 cm.); leaves alternate, obovate-elliptic, rounded or slightly

emarginate at apex, somewhat abruptly contracted to the broadly winged petiole, large (10–11×15 cm. or more), impressed-punctulate, very obscurely pinnate-veined, slightly revolute; petiole long (8–12 cm.); spikes mostly paired at the upper nodes of a stout zigzag 1-leaved prolongation of the stem, moderately thick and long (2–3×100 mm.), obtuse; peduncle long (3–4.5 cm.); bracts round-peltate; berries honey-colored, conic-ovoid, tapering into a nearly equilong, stout, conic beak, the stigma anterior on the lower part of the beak.

Type in the herbarium of the New York Botanical Garden, collected at Bismarck, Province of Coclé, Panama, by R. S. Williams (no. 433).

RANGE: Southern Panama.

38. Peperomia oblongibacca C. DC. Candollea 1: 288, 400. 1923.

COLÓN: Río Fató, *Pittier* 3891.

39. Peperomia piperorum Trel., sp. nov.

A moderately large, succulent, glabrous, pendent, arboricolous herb; stem moderate (3 mm.), more or less scurfy-exfoliating; leaves alternate, subsessile, lanceolate, sharply long-acuminate, subacute at base, moderate (1.5×4 cm.) or becoming rather large (fully 2×6 cm.), drying opaque and thick and somewhat yellowish and granular beneath, pinnately veined, the branches of the midrib about 3×2; petiole thick, scarcely 2 mm. long; spikes terminal on the short narrow-bracted apex, moderately slender and short (2×40–60 mm.), closely flowered; peduncle slender, 1 cm. long; bracts large, round-peltate; berry reddish, oblong, short and thick, acuminately oblique-truncate; stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,166,334, collected along Río Agua Salud, near Frijoles, Canal Zone, Panama, by C. V. Piper (no. 6035).

RANGE: Central Panama.

40. Peperomia ciliolibractea C. DC. Candollea 1: 360, 383. 1923.

PANAMA: Charara River near Chepo, *Pittier* 4712. CANAL ZONE: Las Cascadas Plantation, *Standley* 25731.

41. Peperomia caudulilimba C. DC. Ann. Cons. Jard. Bot. Genève 21: 269. 1920.

CANAL ZONE: Río Indio de Gatún, *Pittier* 2788.

41a. Peperomia caudulilimba marragantina C. DC. Ann. Cons. Jard. Bot. Genève 21: 269. 1920.

PANAMA: Marragantí, *Williams* 694.

41b. Peperomia caudililimba cryptopoda Trel., var. nov.

Peperomia glabriramea Auct. as to Panama.

A moderate-sized repent herb, rooting from the nodes; stem moderate (3–4 mm.), glabrous, or pubescent below the petiole margins; leaves alternate, lanceolate, gradually acuminate, somewhat rounded at base, rather large (2.5–4.5×8–11 cm.), pinnately veined from below about the middle, the delicate branches of the midrib 3 or 4×2, glabrous; petiole very short (scarcely 5 mm.), sometimes ciliate; spikes solitary or paired on sparsely hairy, bracted stalks less than 5 mm. long, filiform and elongate (1×110 mm.); peduncle very short (5 mm.); bracts round-peltate; berries obconical-oblong, truncately scutulate with short horizontal beak; stigma anterior.

Type in the U. S. National Herbarium, no. 715837, collected at Boca de Pauarandó, Sambú River, Darién, Panama, by H. Pittier (no. 5571).

CANAL ZONE: Río Indio de Gatún, *Maxon* 4864.

RANGE: Panama.

41c. Peperomia caudulilimba longependula C. DC. Ann. Cons. Jard. Bot. Genève **21**: 269. 1920.

CANAL ZONE: Fort Sherman, *Standley* 31118. Barro Colorado Island, *Standley* 31321.

42. Peperomia cylindribacca C. DC. Candollea **1**: 370, 385. 1923.

CHIRIQUÍ: San Felix, *Pittier* 5273.

43. Peperomia gatunensis C. DC. Candollea **1**: 363, 389. 1923.

PANAMA: *Seemann* 608. CANAL ZONE: Gorgona to Gatún, *Pittier* 2280. Río Indio de Gatún, *Maxon* 4818. Barro Colorado Island, *Standley* 31356. COCLÉ: Penonomé, *Williams* 366.

44. Peperomia mameiana C. DC. Candollea **1**: 290, 396. 1923.

CANAL ZONE: Mamei Hill, *Pittier* 3805.

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UNITED STATES NATIONAL HERBARIUM

VOLUME 26, PART 3

COSTA RICAN MOSSES COLLECTED BY PAUL C. STANDLEY IN 1924–1926

By EDWIN B. BARTRAM

UNITED STATES
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11

PREFACE

The present installment of the Contributions from the United States National Herbarium consists of an account, by Edwin B. Bartram, of a collection of mosses obtained in Costa Rica by Paul C. Standley, associate curator of the National Herbarium. The collection was made during an investigation of the flowering plants in two visits to Costa Rica in the early part of 1924 and the winter of 1925-26.

Two hundred seventy-two species and varieties are enumerated, over one-third of which are new to Costa Rica. Many of them are South American species, not previously recorded from North America. In addition, Mr. Bartram describes 42 new species and varieties and one new genus from Costa Rica.

The wet mountain forests of Central America are rich in mosses, especially in epiphytic forms. No student of this group of plants has ever collected in the region, except in Panama, and there is every reason to expect that when a specialist in mosses explores Central America thoroughly it will be found to yield a very large number of species at present unknown.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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COSTA RICAN MOSSES COLLECTED BY PAUL C. STANDLEY IN 1924–1926

By Edwin B. Bartram

INTRODUCTION

The mosses collected in Costa Rica by Mr. Standley comprise about 1,300 numbers, representing 272 species and varieties, collected in an area extending from the Atlantic Ocean to the Pacific Ocean, including the Provinces of Limon, Cartago, San Jose, Alajuela, Heredia, and Guanacaste. They represent a very sensible and important addition to our knowledge of the moss flora of Central America. The collection forms a comprehensive cross section of the entire country from sea level on both sides to the higher altitudes in the interior, including the only known paramos north of the Isthmus of Panama.

The higher tropical mountains are famous collecting grounds for bryologists, and the humid forests of Costa Rica, at elevations of from 2,000 to 3,000 meters, are evidently no exception, for they proved to be the most productive of new species and of types previously known only from the cordilleran regions of South America. Among the South American species that seem not to have been recorded before from Central America are: *Fissidens flexinervis, Holomitrium longifolium, Ochrobryum obtusifolium, Leucobryum crispum, Leucobryum martianum, Octoblepharum mittenii, Leptodontium filescens, Funaria bonplandii, Tayloria scabriseta, Rhizogonium mnioides, Bartramia defoliata, Breutelia chrysea, Macromitrium didymodon, Lepyrodon tomentosus, Prionodon luteovirens, Prionodon fusco-lutescens, Eucatagonium politum, Porotrichum plicatulum, Cyclodictyon rubrisetum, Hookeriopsis variabilis, Thamniopsis pendula, Hypnella pilifera, Meiotheciopsis lageniformis,* and *Glossadelphus truncatulus.* The facts are suggestive, and one can not well avoid the conclusion that this moss flora, as a whole, has a closer and much more logical bond with South America, and to a lesser degree with the Antilles, than with the arid table-lands of central Mexico, in which a group of rather isolated types has been evolved to meet the more exacting

conditions of growth and reproduction. The sporadic occurrences of a few North American species, such as *Dicranella heteromalla*, *Dicranella rufescens*, and *Sphagnum recurvum*, probably represent remnants of a wider geographical distribution, that have found congenial habitats favorable to existence.

Mr. Standley's explorations extended into virgin country never before visited by botanists, and a considerable percentage of the mosses he collected represent the following new species and varieties described below for the first time: *Dicranella standleyi*, *Campylopus standleyi*, *Campylopus standleyi* var. *lutescens*, *Campylopus atratus*, *Campylopus costaricensis*, *Campylopus straminifolius*, *Campylopus falcatulus*, *Dicranodontium meridionale*, *Holomitrium williamsi*, *Holomitrium standleyi*, *Dicranoloma brittonae*, *Dicranoloma setaceum*, *Syrrhopodon cristatus*, *Syrrhopodon therioti*, *Leptodontium sulphureum* var. *flagellaceum*, *Brachymenium viviparum*, *Brachymenium standleyi*, *Anomobryum costaricense*, *Macromitrium standleyi*, *Macromitrium standleyi* var. *subundulatum*, *Macromitrium verrucosum*, *Macromitrium fusco-aureum*, *Macromitrium fuscescens*, *Macromitrium williamsi*, *Macromitrium mammillosum*, *Macromitrium costaricense*, *Macromitrium hirtellum*, *Lepyrodon tomentosus* var. *latifolius*, *Prionodon densus* var. *crispatulus*, *Meteoriopsis patula* var. *congesta*, *Pilotrichum pallidum*, *Daltonia aristifolia*, *Cyclodictyon brittonae*, *Hookeriopsis standleyi*, *Hookeriopsis obtusifolia*, *Lepidopilum carneum*, *Thuidium miradoricum* var. *gracilescens*, *Brotherella minutula*, *Glossadelphus longisetus*, *Hypnum polypterum* var. *robustum*, *Isopterygium integrifolium*, *Microthamnium laxulum;* also the genus *Neohypnella* with the species *Neohypnella mucronifolia*. Types of all of these species are in the National Herbarium, United States National Museum, and in the herbarium of the writer. Many of the species described by Renauld and Cardot[1] and by Brotherus and Thériot[2] are again represented here and, while at least one-third of the species in the accompanying list seem not to have been recorded before from Costa Rica, there is every reason to think that further explorations, especially in the more inaccessible parts, will add still more abundantly to the moss flora of this rich and interesting country.

The preponderance of tree-growing mosses is characteristic of tropical and subtropical regions, and this collection is especially rich in these types. There are fine, full series of such genera as *Macromitrium*, *Prionodon*, *Holomitrium*, *Campylopus*, etc., and I have prepared keys to these and other groups in an effort to present the natural relationship of the species to the best advantage.

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[1] Bulletin de la Société royal de botanique de Belgique **31**: 143–173. 1893; **32**: 174–201. 1894; **41**: 125–148.

[2] Société Havraise d'études diverses **1921**: 307–315. 1921.

The sequence of the genera is in the order used by Brotherus in Engler and Prantl's Pflanzenfamilien, edition 2, volumes 10 and 11, and, with few exceptions, the nomenclature is in accordance with this work. Full data for the collections cited are given in the following list:

Alto de la Estrella. Alto de la Estrella, Province of Cartago, March 26–27, 1924. Paul C. Standley, collector.

El Arenal. El Arenal, Province of Guanacaste, altitude 485 to 600 meters, January 18–19, 1926. Paul C. Standley and Juvenal Valerio, collectors.

Between Aserrí and Tarbaca. Between Aserrí and Tarbaca, Province of San Jose, altitude 1,200 to 1,700 meters, December 6, 1925. Paul C. Standley.

Los Ayotes. Los Ayotes, near Tilaran, Province of Guanacaste, altitude 600 to 700 meters, January 21, 1926. Standley and Valerio.

Camino de Hatillo. Camino de Hatillo, near San Jose, altitude 1,200 meters, January 29, 1924. Paul C. Standley.

Vicinity of Capulin. Vicinity of Capulin, on the Rio Grande de Tarcoles, Province of Alajuela, altitude 80 meters, April 2, 1924. Paul C. Standley.

Near Carmen Station. Near Carmen Station, on the Indiana Branch, Province of Limon, February 20, 1926. Standley and Valerio.

Cerro de la Carpintera. Cerro de la Carpintera, Province of Cartago, altitude 1,500 to 1,800 meters, February, 1924. Paul C. Standley.

Cerro de las Caricias. Cerro de las Caricias, north of San Isidro, Province of Heredia, altitude 2,000 to 2,400 meters, March 11, 1926. Standley and Valerio.

Cerro de las Lajas. Cerro de las Lajas, north of San Isidro, Province of Heredia, altitude 2,000 to 2,400 meters, March 7, 1926. Standley and Valerio.

Cerro de Piedra Blanca. Cerro de Piedra Blanca, above Escasu, Province of San Jose, January 31, 1924. Paul C. Standley.

Cerro de las Vueltas. Cerro de las Vueltas, Province of San Jose, altitude 2,700 to 3,000 meters, December 29, 1925, to January 1, 1926. Standley and Valerio.

Cerros de Zurqui. Cerros de Zurqui, northeast of San Isidro, Province of Heredia, altitude 2,000 to 2,400 meters, March 3, 1926. Standley and Valerio.

La Colombiana Farm. La Colombiana Farm of the United Fruit Company, Province of Limon, altitude 70 meters, March 6–7, 1924. Paul C. Standley.

Dulce Nombre. Dulce Nombre, Province of Cartago, altitude 1,400 meters, February 27, 1924. Paul C. Standley.

Region of La Esperanza. Region of La Esperanza, southern slope of Volcan de Irazu, February 23, 1924. Paul C. Standley.

La Estrella. La Estrella, Province of Cartago, March 26–27, 1924. Paul C. Standley.

Near Finca La Cima. Near Finca La Cima, above Los Lotes, north of El Copey, Province of San Jose, altitude 2,100 to 2,400 meters, December 21–22, 1925. Paul C. Standley.

Finca Las Concavas. Finca Las Concavas, Province of Cartago, altitude 1,200 to 1,300 meters, December 7–8, 1925. Paul C. Standley.

Finca Montecristo. Finca Montecristo, on the Rio Reventazon, below Cairo, Province of Limon, altitude 25 meters, February 18–19, 1926. Standley and Valerio.

Vicinity of Fraijanes. Vicinity of Fraijanes, Province of Alajuela, altitude 1,500 to 1,700 meters, February 12–13, 1926. Paul C. Standley and Ruben Torres Rojas.

Vicinity of Guapiles. Vicinity of Guapiles, Province of Limon, altitude 300 to 500 meters, March 12–13, 1924. Paul C. Standley.

Hamburg Finca. Hamburg Finca, on the Rio Reventazon, below Cairo, Province of Limon, altitude 55 meters, February 19, 1926. Standley and Valerio.

La Hondura. La Hondura, Province of San Jose, altitude 1,300 to 1,700 meters, March 2–4, 1924. Paul C. Standley.

Laguna de la Chonta. Laguna de la Chonta, northeast of Santa Maria de Dota, Province of San Jose, altitude 2,000 to 2,100 meters, December 18, 1925. Paul C. Standley.

Laguna de la Escuadra. In dense oak and bamboo forest near Laguna de la Escuadra, northeast of El Copey, Province of San Jose, altitude 2,000 to 2,200 meters, December 16, 1925. Paul C. Standley.

El Muñeco. El Muñeco, south of Navarro, Province of Cartago, altitude 1,400 meters, February 8–9, 1924. Paul C. Standley; March 6–7, 1926, Standley and Torres.

Naranjos Agrios. Naranjos Agrios, Province of Guanacaste, altitude 600 to 700 meters, January 29, 1926. Standley and Valerio.

Las Nubes. Las Nubes, Province of San Jose, altitude 1,500 to 1,900 meters, March 20–22, 1924. Paul C. Standley.

Vicinity of Orosi. Vicinity of Orosi, Province of Cartago, March 30, 1924. Paul C. Standley.

La Palma. La Palma, Province of San Jose, altitude 1,600 meters, March 17, 1924. Paul C. Standley.

Quebrada Serena. Quebrada Serena, southeast of Tilaran, Province of Guanacaste, altitude 700 meters, January 27, 1926. Standley and Valerio.

Quebradillas. Oak forest near Quebradillas, about 7 km. north of Santa Maria de Dota, Province of San Jose, altitude 1,800 meters, December 24, 1925. Paul C. Standley.

Along the Rio Maria Aguilar. Along the Rio Maria Aguilar, near San Jose, altitude about 1,200 meters, March 25, 1924. Paul C. Standley.

Along Rio Reventado. Along the Rio Reventado, north of Cartago, altitude 1,450 to 1,650 meters, February 26, 1926. Standley and Valerio.

Rio Birris. Rio Birris, southern slope of Volcan de Irazu, February 23, 1924. Paul C. Standley.

Vicinity of Pejivalle. Vicinity of Pejivalle, Province of Cartago, altitude 900 meters, February 7–8, 1926. Standley and Valerio.

Between San Pedro Montes de Oca and Curridabat. Between San Pedro Montes de Oca and Curridabat, Province of San José, altitude 1,200 meters, February 2, 1924. Paul C. Standley.

Vicinity of San Sebastian. Vicinity of San Sebastian, Province of San Jose, altitude 1,160 meters, February 23, 1926. Paul C. Standley.

Vicinity of Santa Maria de Dota. Vicinity of Santa Maria de Dota, Province of San Jose, altitude 1,500 to 1,800 meters, December 14–26, 1925. Standley and Valerio.

El Silencio. El Silencio, near Tilaran, Province of Guanacaste, altitude 750 meters, January 13, 1926. Standley and Valerio.

La Tejona. La Tejona, north of Tilaran, Province of Guanacaste, altitude 600 to 700 meters, January 25, 1926. Standley and Valerio.

Vicinity of Tilaran. Vicinity of Tilaran, Province of Guanacaste, altitude 500 to 650 meters, January 10–31, 1926. Standley and Valerio.

La Ventolera. La Ventolera, on the southern slope of the Volcan de Poas, altitude 1,700 meters, February 17–18, 1924. Paul C. Standley.

Viento Fresco. Viento Fresco, Province of Alajuela, altitude 1,600 to 1,900 meters, February 13, 1926. Standley and Torres.

Volcan de Poas. Upper slopes of Volcan de Poas, between the hotel and the crater, altitude 2,500 to 2,640 meters, February 17, 1924. Paul C. Standley.

Volcan de Turrialba. Southern slope of the Volcan de Turrialba, near the Finca del Volcan de Turrialba, altitude 2,000 to 2,400 meters, February 22, 1924. Paul C. Standley.

Yerba Buena. Yerba Buena, northeast of San Isidro, Province of Heredia, altitude 2,000 meters, February 22–28, 1926. Standley and Valerio.

Vicinity of Zapote. Vicinity of Zapote, Province of San Jose, altitude about 1,200 meters, April 4, 1924. Paul C. Standley.

Zurqui. Zurqui, Province of San Jose, altitude 2,500 meters, February 13, 1926. Standley and Valerio.

It has been indeed a privilege to work with a collection such as Mr. Standley has made. The selections reflect care and judgment, the specimens are abundant, clean, very little mixed, and well prepared, and the series is undoubtedly among the most instructive and comprehensive that has ever come out of Central America.

I am very grateful to Mrs. Elizabeth G. Britton and Mr. R. S. Williams, of the New York Botanical Garden, for pertinent suggestions and for the loan of type specimens, particularly those from the Mitten Herbarium, for critical comparative studies, and to Mr. Standley, Dr. William R. Maxon, and the authorities of the National Museum for the loan of specimens and for help in various ways.

LIST OF SPECIES

Sphagnaceae

Sphagnum magellanicum Brid. Musc. Recent. 2[1]: 24. 1798.

Cerro de las Vueltas, nos. 43657a, 43861, 43918a.

DISTRIBUTION: North America; Bermuda; South America; Europe; Asia.

This seems to be the first record for Central America.

Sphagnum recurvum Beauv. Prodr. Aethéog. 88. 1805.

Volcan de Poas, no. 34844; Laguna de la Chonta, nos. 42315, 42328.

DISTRIBUTION: Cuba; Panama; South America; Europe; Asia; North America.

Dr. Andrews tells me that this species has recently turned up in Panama and Cuba, so that its occurrence in Costa Rica is not unexpected. The chlorophyll cells of the branch leaves are exposed only on the outer surface, a character that seems to distinguish this species from *S. cuspidatum* Ehrh., with which it is obviously very closely allied.

Sphagnum meridense (Hampe) C. M. Syn. Musc. Frond. 1: 95. 1848.

Cerro de las Vueltas, nos. 43926, 43614, 43657, 43860, 43648, 43603, 43608, 43501, 43689, 43683, 43811, 43843; Laguna de la Chonta, no. 42337; Volcan de Poas, no. 34922.

DISTRIBUTION: Florida; West Indies; Mexico; Central America; South America.

Andreaeaceae

Andreaea turgescens Schimp. in C. M. Syn. Musc. Frond. 2: 515. 1851.

Cerro de las Vueltas, no. 43610.

DISTRIBUTION: Mexico.

Apparently the first record for this species outside of Mexico.

Fissidentaceae

Fissidens tortilis Hampe & C. M. Bot. Zeit. 22: 340. 1864.

Dulce Nombre, no. 35944a.

DISTRIBUTION: Mexico.

Fissidens asplenioides (Swartz) Hedw. Descr. Musc. Frond. 3: 65. 1801.

Rio Reventado, nos. 49394, 49554; Zurqui, no. 48110; Dulce Nombre, no. 35944c; Las Nubes, nos. 38407, 38578; La Hondura, no. 36549; Cerro de las Caricias, no. 51972 (forma); Volcan de Turrialba, no. 35295; Yerba Buena, no. 49760.

DISTRIBUTION: Jamaica; Costa Rica; South America; Africa; Sumatra; Java; Queensland.

Fissidens oerstedianus C. M. Syn. Musc. Frond. 2: 529. 1851.

Finca la Cima, no. 42799; La Estrella, no. 39405; Zurqui, no. 48086; Cerros de Zurqui, no. 50397; El Muñeco, no. 33879; Cerro de las Lajas, no. 51479.

DISTRIBUTION: Costa Rica.

There is very little to separate satisfactorily this species from *F. polypodioides* (Swartz) Hedw., and I am strongly tempted to believe that it is merely a poorly defined form of the latter species.

Fissidens flexinervis Mitt. Journ. Linn. Soc. 12: 588. 1869.

El Muñeco, no. 51254a. These specimens agree with *Spruce* 493, from the Rio Negro, except that the leaf cells average somewhat larger and the costa disappears clear below the apex in all the leaves.

DISTRIBUTION: South America.

Ditrichaceae

Ceratodon stenocarpus B. S. G. Bry. Eur. (29–30) Cerat. 4. 1846.

Finca la Cima, nos. 42579, 42699; Rio Reventado, no. 49496; Volcan de Turrialba, no. 35298.

DISTRIBUTION: Mexico; Central America; South America; Corsica; Portugal; Africa; Asia.

Dicranaceae

Aongstroemia jamaicensis C. M. Bull. Herb. Boiss. 5: 554. 1897.

Rio Birris, no. 35407; Volcan de Turrialba, no. 35269.

DISTRIBUTION: Jamaica; Mexico.

The first record for this species south of Mexico.

Dicranella herminieri Besch. Ann. Sci. Nat. VI. Bot. 3: 180. 1876.

La Colombiana Farm, no. 37305.

DISTRIBUTION: Southern United States; West Indies; Mexico; Costa Rica.

Dicranella heteromalla (L.) Schimp. Coroll. Bry. Eur. 13. 1855.

Volcan de Poas, no. 34899.

DISTRIBUTION: North America; Costa Rica; Europe; Asia.

Dicranella hilariana (Mont.) Mitt. Journ. Linn. Soc. 12: 31. 1869.

Between Aserri and Tarbaca, no. 41327.

DISTRIBUTION: Southern United States; Mexico; Central America; West Indies; South America.

Dicranella rufescens (Dicks.) Schimp. Coroll. Bry. Eur. 13. 1855.

Volcan de Turrialba, no. 35293.

DISTRIBUTION: North America; Europe; Asia.

Dicranella standleyi Bartr., sp. nov. FIG. 1.

Dioicous. Male plants mixed with the fruiting plants, 4 to 5 mm. high; antheridial flower terminal; bracts abruptly subulate acuminate from a broad, clasping base; antheridia about 20, averaging 0.6 mm. long, with numerous filiform paraphyses of equal length or shorter. Fertile plants about 1 cm. high, in rather dense, yellowish green, silky tufts, sparingly radiculose at the extreme base; stem leaves from a short, erect, oblong or obovate base abruptly narrowed to a flat, linear, setaceous point composed almost entirely of the excurrent costa; lower leaf cells long-rectangular, firm, becoming shorter and more incrassate in the shoulders of the leaf, with the marginal row subquadrate; costa about 100 μ wide at the base, indistinct below, tapering upwards and excurrent from a little above the shoulder of the leaf or indistinctly margined with a single row of shorter cells; margins plane below, revolute just above the shoulders and flat above, sparingly serrulate at the extreme apex, entire below; cells of the upper lamina short-rectangular and chlorophyllose; perichaetial leaves similar to the stem leaves but with a longer, convolute-clasping base; seta pale yellow, erect,

1 cm. long; capsule oblong, strumose, inclined, 1.5 mm. long, smooth or lightly ribbed when old and empty, without stomata; annulus large; lid obliquely rostrate, about equalling the capsule; peristome teeth vertically striate more than halfway up, divided to about the middle into slender papillose forks; spores rough, about 18 μ in diameter.

Type: Wet bank, Yerba Buena, northeast of San Isidro, Province of Heredia, Costa Rica, Paul C. Standley and Juvenal Valerio, February 22 to 28, 1926, no. 50086.

This species is very distinct from *D. perrottetii* (Mont.) Mitt. in the shape of the leaves and in the long excurrent costa.

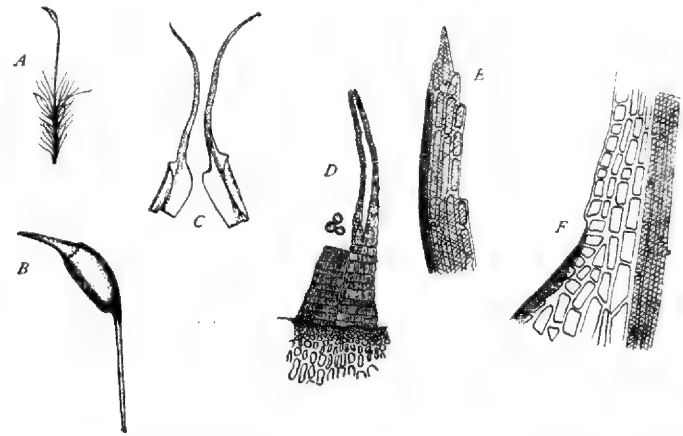

FIG. 1.—*Dicranella standleyi* Bartr. *A*, fruiting plant, natural size; *B*, moist, operculate capsule, × 5.5; *C*, two leaves, × 9; *D*, part of peristome, × 80; *E*, apex of leaf, × 240; *F*, shoulder of leaf, × 240

KEY TO THE COSTA RICAN SPECIES OF CAMPYLOPUS

Costa without stereid bands in upper half of leaf. (PSEUDOCAMPYLOPUS.)
C. chrismari.

Costa with stereid bands.
Stereid bands on dorsal side of costa only. (EUCAMPYLOPUS.)
Leaves without hyaline hair-points.
Basal cells with pitted lateral walls ..... **C. hoffmanni.**
Basal cells with nearly straight lateral walls.
Leaves up to 15 or 20 mm. long; costa up to 1 mm. broad or more.
C. standleyi.
Leaves not over 10 mm. long; costa much narrower.
Plants commonly fertile.
Costa 200 μ wide or more near the base.
Basal cells short.
Costa 400 μ wide or more ..... **C. straminifolius.**
Costa about 200 μ wide ..... **C. subleucogaster.**
Basal cells elongate ..... **C. flexuosus.**
Costa 150 μ wide or less, near the base ..... **C. sargii.**
Plants commonly sterile; costa 300 to 600 μ wide.
Stems 1 to 2 cm. high; costa 300 to 400 μ wide ..... **C. roellii.**
Stems taller; costa 500 to 600 μ wide ..... **C. hellerianus.**
Leaves with hyaline points.
Costa with serrate lamellae 2 or 3 cells high on back ..... **C. introflexus.**

Costa not lamellose.
Costa 300 μ wide or more.
Alar cells inconspicuous; basal cells lax and pellucid—**C. oerstedianus.**
Alar cells conspicuous, reddish, inflated; basal cells firm, incrassate. **C. atratus.**
Costa 200 μ wide or less—**C. costaricensis.**
Stereid bands on both sides of costa. (PALINOCRASPIS.)
Lower leaf cells with straight lateral walls.
Leaves serrate halfway down—**C. filifolius.**
Leaves serrulate scarcely one-third of the way down—**C. porphyreodictos.**
Lower leaf cells with pitted lateral walls.
Costa excurrent into a long rough point.
Leaves up to 15 or 20 mm. long—**C. harrisi var. longifolius.**
Leaves 10 mm. long or less—**C. harrisi.**
Costa short-excurrent—**C. falcatulus.**

Campylopus chrismari (C. M.) Mitt. Journ. Linn. Soc. **12**: 88. 1869.

Cerro de las Vueltas, nos. 43658, 43656, 43726, 43929; Volcan de Poas, nos. 34923a, 34888, 34926; Volcan de Turrialba, nos. 35160, 35101a.

DISTRIBUTION: Mexico; Costa Rica; Guatemala.

Campylopus flexuosus (L.) Brid. Musc. Recent. Suppl. **4**: 71. 1819.

La Estrella, no. 39245a; Las Nubes, no. 38754; Yerba Buena, no. 49135a. Quebradillas, no. 43022b.

DISTRIBUTION: Vancouver Island; Mexico; Europe.

Campylopus subleucogaster (C. M.) Jaeg. & Sauerb. Ber. St. Gall. Nat. Ges. **1877–78**: 381. 1879.

Volcan de Turrialba, no. 35244; Cerro de las Caricias, no. 52204; Cerros de Zurqui, no. 50485; Las Nubes, no. 38462b; Cerro de las Vueltas, no. 43538a; El Muñeco, no. 51317; Finca la Cima, no. 42696.

DISTRIBUTION: Alabama; Arizona; Costa Rica; Guatemala.

Campylopus hoffmanni (C. M.) Ren. & Card. Bull. Soc. Bot. Belg. **31**[1]: 147. 1893.

Cerro de las Caricias, no. 52141; Cerros de Zurqui, nos. 50511, 50341; Laguna de la Chonta, no. 42331; Cerro de las Vueltas, no. 43685.

DISTRIBUTION: Costa Rica.

Campylopus standleyi Bartr., sp. nov. FIG. 2.

Dioicous. Plants in deep, glossy, yellowish green tufts with branched stems up to 12 cm. high, tomentose throughout. Leaves up to 20 mm. long; comal tufts cuspidate with flexuous points, widely spreading below, somewhat flexuous when dry, often reflexed in the older parts, gradually narrowed to a long filiform grooved point from an ovate-oblong base up to 1.6 mm. wide, the narrow leaf blade extending almost to the apex; margins serrulate for a short distance below the apex, entire below, inflexed from just above the insertion; costa excurrent into a short, denticulate point, reddish-brown at the insertion, yellow above, up to 1.25 mm. wide at the base and about four-fifths of the width of the leaf, in cross-section showing a row of large cells on the ventral side extending about halfway through the leaf, with a stereid band on the dorsal side interrupted by larger differentiated cells; alar cells dark red, forming very conspicuous, more or less inflated auricles, the cells just above short-rectangular or rhomboidal, gradually narrowed towards the margins and quickly becoming longer and narrower upward with thick, pitted lateral walls toward the costa, the upper cells small and irregularly rhomboidal on the margins, more elongate toward the costa; perichaetial leaves with strongly clasping bases, abruptly narrowed to the long excurrent costa, the outer much smaller; seta sinuous when dry, 12 to 14 mm. long, smooth; capsule curved, furrowed and slightly strumose when dry, the mouth

oblique, 2 mm. long without the lid, the exothecal cells rectangular; peristome teeth 0.66 mm. long, 75 μ wide at the base, divided about one-third of the way down; annulus large; calyptra unknown; lid conic-rostrate, oblique, 1.5 mm. long; spores papillose, 15 μ in diameter.

TYPE: Wet bank in paramo, Cerro de las Vueltas, Province of San Jose, Costa Rica, altitude 2,700 to 3,000 meters, Paul C. Standley and Juvenal Valerio, December 29, 1925 to January 1, 1926, no. 43939. Also from the following localities: Las Nubes, no. 38639; near Finca la Cima, no. 42696a.

This species, *C. hoffmanni* (C. M.) Ren. & Card., and *C. brittonae* R. S. Williams form a closely related trio with many characters in common, but *C. standleyi* appears to be clearly distinct from either of the others in the more robust habit, and the wider leaves, with the costa up to 1.25 mm. wide, or twice as wide as in either of the other two species. The sporophyte characters are especially interesting as being the first known for any of this group.

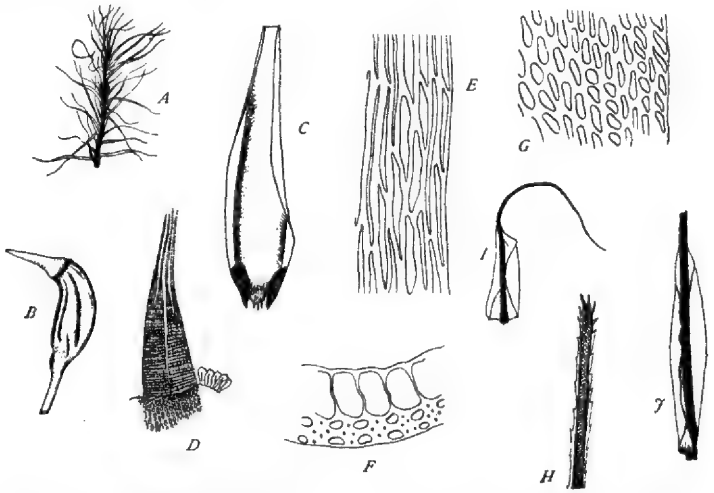

FIG. 2.—*Campylopus standleyi* Bartr. *A*, end of fertile stem, moist, one-half natural size; *B*, operculate capsule, dry, × 5.5; *C*, leaf base, × 5.5; *D*, part of peristome, × 42; *E*, basal cells and margin just above the alar group, × 240; *F*, part of cross section of costa, × 240; *G*, lower median cells and margin, × 240; *H*, apex of leaf, × 42; *I*, outer perichaetial leaf, × 5.5; *J*, base of inner perichaetial leaf, × 5.5

Campylopus standleyi Bartr. var. **lutescens** Bartr., var. nov. FIG. 3.

Differs from the species in the shorter basal cells, narrower leaf blade in the basal portion and in the margins sharply serrate more than one-third of the way down.

TYPE: Shaded bank, vicinity of Santa Maria de Dota, Province of San Jose, Costa Rica, altitude 1,500 to 1,800 meters, Paul C. Standley and Juvenal Valerio January 3, 1926, no. 43372.

Campylopus hellerianus (Hampe) Jaeg. Ber. St. Gall. Nat. Ges. **1870–71**: 417. 1872.

Vicinity of Orosi, nos 39703, 39629; Viento Fresco, no. 47952b; La Estrella, no. 39252a; Santa Maria de Dota, nos. 41657, 41661; vicinity of Fraijanes, no. 47460; Quebradillas, no. 43016.

DISTRIBUTION: Mexico.

The specimens referred here more nearly approach the type of *C. hellerianus*, than they do *C. roellii*, and it does not seem at all improbable that the latter is only a form of the older species and should be treated as a synonym. In this series from Costa Rica some of the more robust plants, with leaves up to 8 or

9 mm. long, show the margins serrate about one-third of the way down, while others, that are indistinguishable in other particulars, show the margins entire except at the extreme apex and almost precisely like those from the type collection of *C. hellerianus*.

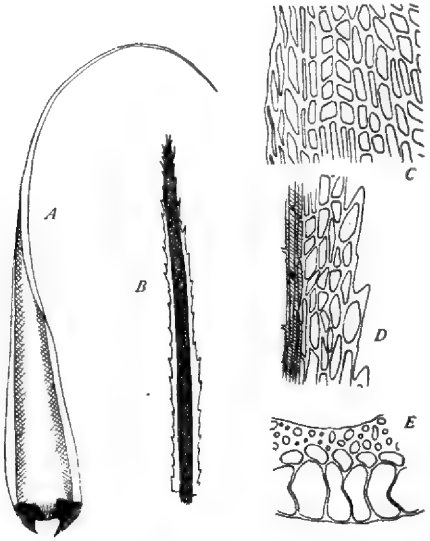

FIG. 3.—*Campylopus standleyi* Bartr. var. *lutescens* Bartr. *A*, a rather small leaf, × 5.5; *B*, apex of leaf, × 42; *C*, basal cells and margin just above the alar group, × 240; *D*, median leaf cells and margin, × 240; *E*, part of cross section of costa, × 240

Campylopus introflexus (Hedw.) Brid. Bryol. Univ. **1**: 472. 1826.

Zurqui, no. 48139; vicinity of Fraijanes, no. 47476a; Santa Maria de Dota nos. 41713, 42429.

DISTRIBUTION: Southern United States; Mexico; Central America; West Indies; South America; Africa; Australia.

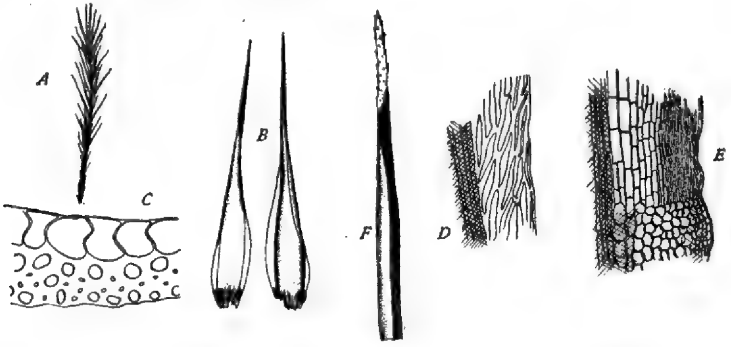

FIG. 4.—*Campylopus atratus* Bartr. *A*, plant, natural size; *B*, two stem leaves, × 5.5; *C*, part of cross section of costa, × 240; *D*, median cells and margin, × 240; *E*, one side of leaf base, × 85; *F*, apex of leaf, × 42

Campylopus atratus Bartr., sp. nov. FIG. 4.

Plants in compact, blackish green tufts with stiff erect stems about 2.5 cm. high, simple or sparingly branched, radiculose; leaves erect-appressed, stiff, up to 7 mm. long, lanceolate-subulate, concave and tubulose, ending in a denticulate

hyaline point; costa excurrent, smooth on the back, up to 600 μ wide at the base and about two-thirds the width of the leaf, radiculose on the back in the lower part, in cross-section showing a ventral row of large cells extending about halfway through the leaf, with a median row of smaller cells and a dorsal stereid band, differentiated on the surface; alar cells reddish or hyaline, forming a conspicuous, inflated group extending to the costa; the cells just above short-rectangular or rhomboidal with thick walls, narrower toward the margins, gradually becoming linear-flexuose upward with rounded ends and smooth incrassate walls, in the narrower part of the upper blade linear, 3 to 5 μ wide and up to 35 μ long.

TYPE: Wet bank in paramo, Cerro de las Vueltas, Province of San Jose, Costa Rica, altitude 2,700 to 3,000 meters, Paul C. Standley and Juvenal Valerio, December 29, 1925 to January 1, 1926, no. 43686.

While this species has the habit and gross appearance of *Thysanomitrium richardi* Schwaegr., it is surely amply distinct in the structure of the nerve which, in cross-section, shows a row of large empty cells on the ventral side extending halfway through the leaf with no trace of a stereid band on the inner side. The structure is typical of the section *Eucampylopus* and in view of the diagnostic

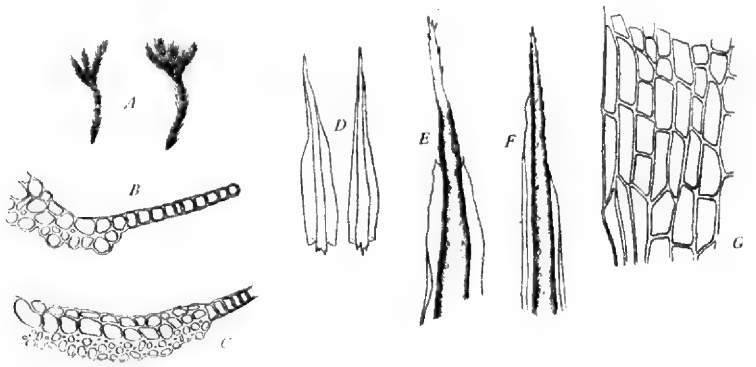

FIG. 5.—*Campylopus costaricensis* Bartr. *A*, two plants, natural size; *B*, part of cross section from upper part of costa, × 240; *C*, part of cross section from lower part of costa, × 240; *D*, two leaves, × 8; *E*, apex of comal leaf, × 42; *F*, apex of stem leaf, × 42; *G*, basal cells and margin just above the alar group, × 240

value of the nerve structure in this group of plants, I hardly see how the Costa Rican plant can be classed outside of this section of the genus *Campylopus*. M. Thériot has an interesting discussion on the relationship of *T. richardi* and *Campylopus leptodus* Mont. in the Revista Chileña de Historia Natural,[3] which suggests the possibility that *C. atratus* may be closely allied to *C. leptodus*, a comparison that I have had, as yet, no chance to investigate. At any rate, the Costa Rican species forms an interesting and suggestive link between these two closely related genera.

Campylopus costaricensis Bartr., sp. nov. FIG. 5.

Plants in short dense tufts, yellowish green above, light brown below. Stems erect or ascending, about 15 mm. high, simple or with a few short innovations in a dense comal tuft; stem leaves appressed or very slightly spreading, oblong-lanceolate, short-acuminate, the margins denticulate at the extreme apex, entire below, reflexed toward the apex, plane in the lower part; costa excurrent into a short concolorous denticulate point; comal leaves similar but with the costa excurrent into a longer hyaline denticulate hair point and the lamina sharply

[3] **29**: 289–290. 1925.

toothed at the extreme apex; costa up to 200 μ wide at the base, ridged on the back below, toward the apex with stronger serrulate ribs but not lamellose, in cross-section below the middle showing two rows of large cells extending about halfway through with a stereid band interrupted by larger cells on the dorsal side; alar cells obscure, hyaline, and fugacious, the cells just above rectangular, hyaline, quickly becoming shorter and chlorophyllose upward; upper cells rhomboidal, chlorophyllose, in rows with rather thin, uniform walls; sporophyte unknown.

TYPE: On tree, Finca Montecristo, on the Rio Reventazon below Cairo, Province of Limon, Costa Rica, Paul C. Standley and Juvenal Valerio, February 18 and 19, 1926, no. 48579.

Judging from the description, this species seems to be near *C. erectus* (C. M.) Mitt., from Colombia, but is distinct in having the costa merely ridged (not lamellose) on the back, and in the reflexed upper leaf margins.

Campylopus porphyreodictos (C. M.) Mitt. Journ. Linn. Soc. **12**: 75. 1869.

La Estrella, no. 39377a; near Finca la Cima, no. 42705; Santa Maria de Dota, no. 41573; Yerba Buena, no. 50120a.

DISTRIBUTION: West Indies; Colombia; Brazil.

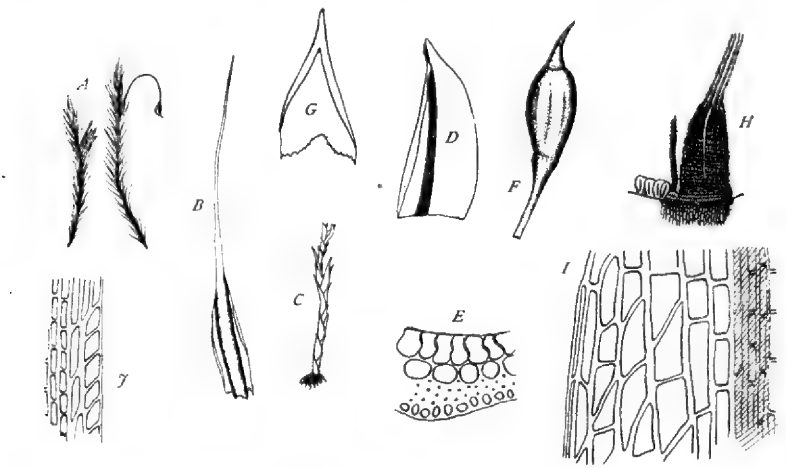

FIG. 6.—*Campylopus straminifolius* Bartr. *A*, two plants, natural size, one with fruit, the other with flagellaceous branches; *B*, stem leaf, × 5.5; *C*, flagellate branch, × 5.5; *D*, leaf from flagellate branch, × 42; *E*, part of cross section of costa, × 240; *F*, capsule, moist, × 5.5; *G*, calyptra, × 9; *H*, part of peristome, × 42; *I*, one side of leaf base just above the alar cells; *J*, upper cells and margin, × 240

Campylopus filifolius (Hornsch.) Mitt. Journ. Linn. Soc. **12**: 76. 1869.

La Estrella, no. 39271a; El Muñeco, no. 33945.

DISTRIBUTION: Costa Rica; Guatemala; Brazil.

Campylopus straminifolius Bartr., sp. nov. FIG. 6.

Plants in dense, pale green or stramineous tufts with slender, simple or obscurely branched stems up to 3.5 cm. high, tomentose throughout, with occasional clusters of short flagellate branches. Leaves closely imbricated, erect with flexuous points to rather curved-secund, up to 9 mm. long, from an oblong-ovate base rather abruptly contracted to a long channeled subula, remotely denticulate on the margins for a short distance below the apex, entire below, the narrow lamina extending nearly to the apex; costa up to 400 μ wide at the base, pale, filling about one-third of the leaf base, in cross-section showing two rows

of large ventral cells, a stereid band on the dorsal side with the outer cells differentiated; alar cells conspicuous, reddish or hyaline, the cells just above rectangular with straight, pellucid walls, gradually narrowed toward the margins, rather quickly becoming rhomboidal upward, in regular rows; seta 10 mm. long, pale, flexuous when dry, smooth; capsule ovoid, regular, furrowed when dry, 1.5 mm. long; lid conic-subulate, 1 mm. long; annulus large; peristome teeth about 70 μ wide at the base, divided less than halfway down; calyptra laciniate at the base.

TYPE: On tree, El Muñeco, on the Rio Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, Paul C. Standley and Rubén Torres, March 6 and 7, 1926, no. 51212.

The longer leaves, broader costa, and presence of flagellate branches seem to distinguish adequately this species from *C. subleucogaster*, to which it is undoubtedly closely allied.

Campylopus harrisi (C. M.) Par. Ind. Bryol. Suppl. 92. 1900.

Cerros de Zurqui, no. 50570a.

DISTRIBUTION: Jamaica.

Campylopus harrisi (C. M.) Par. var. **longifolius** Bartr., var. nov.

Differs from the species in the elongate stems, with the leaves comose at intervals and up to 15 or even 20 mm. long.

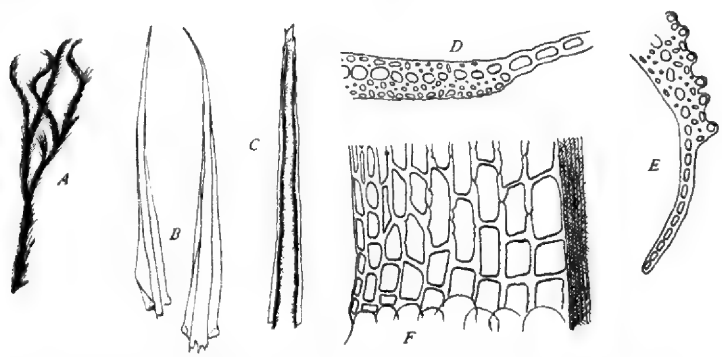

FIG. 7.—*Campylopus falcatulus* Bartr. *A*, plant, one-half natural size; *B*, two stem leaves, × 8; *C*, apex of leaf, × 42; *D*, part of cross section from lower part of costa, × 240; *E*, part of cross section from upper part of costa, × 240; *F*, one side of leaf base just above the alar cells

TYPE: On tree, Cerro de las Lajas, north of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 7, 1926, no. 51638.

The elongate interrupted stems and long setaceous-pointed leaves give this plant a very distinctive appearance, and when more complete material is available it may well prove to be a perfectly distinct species.

Campylopus falcatulus Bartr., sp. nov. FIG. 7.

Plants in loose deep tufts, brownish green, dull, with robust branched stems 6 or 7 cm. long; leaves curved-secund, closely imbricated, about 5 mm. long, linear-lanceolate, gradually narrowed from an oblong base to a rather short, channeled point, remotely denticulate toward the apex, the lamina extending almost to the point; costa about 250 μ wide at the base, more than half as wide as the leaf, ribbed on the back above, excurrent into a short dentate point, in cross-section showing a row of guide cells with narrow stereid bands above and below, differentiated on the dorsal surface; alar cells conspicuous, forming large red inflated auricles and extending to the costa, the cells just above short, rectangular, with thick pitted walls, narrower with straight walls toward the

margins, gradually elongated upward, in the median and upper portions smaller, rhomboidal, in regular rows. Sporophyte unknown.

TYPE: On tree, Cerro de las Lajas, north of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 7, 1926, no. 51507. Also from Yerba Buena, no. 50037.

A more robust plant than *C. arctocarpus*, with shorter leaves, a broader costa, and a more conspicuous, inflated group of alar cells.

Thysanomitrium richardi (Brid.) Schwaegr. Suppl. 2[1]: 61. 1823.

Cerros de Zurqui, no. 50331; Yerba Buena, nos. 50096, 49939a; La Hondura, no. 36227.

DISTRIBUTION: Mexico; Costa Rica; West Indies; South America.

The plants referred to this species are not at all typical, and I have not named them without some misgivings. The costa is narrower than in any specimens with which they have been compared, and the leaves are practically destitute of hyaline hair points, but in other respects the agreement seems to be essentially complete.

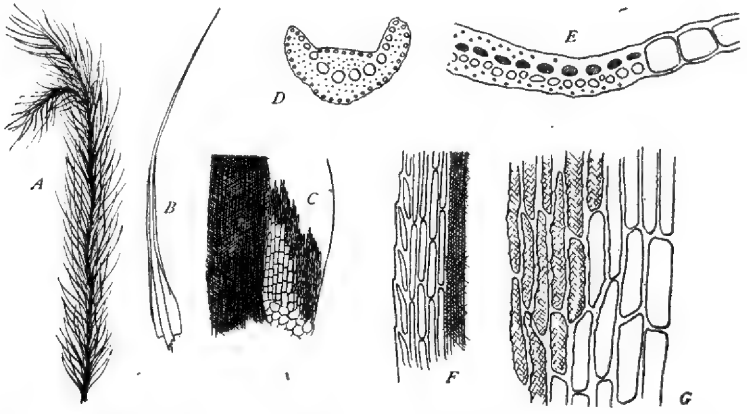

FIG. 8.—*Dicranodontium meridionale* Bartr. *A*, end of stem, natural size; *B*, stem leaf, × 5.5; *C*, one side of leaf base, × 42; *D*, cross section near apex of leaf, × 240; *E*, part of cross section from near base of leaf, × 240; *F*, one side of lamina from upper part of leaf, × 240; *G*, area of basal cells showing junction of inner pellucid cells and outer pitted, chlorophyllose cells, × 240

Pilopogon gracilis (Hook.) Brid. Bryol. Univ. 1: 519. 1826.

Las Nubes, no. 38378; Cerro de las Caricias, no. 52137; La Estrella, no. 39338; near Finca la Cima, no. 42752a; Santa Maria de Dota, no. 43412; Cerros de Zurqui, no. 50581.

Dicranodontium meridionale Bartr., sp. nov. FIG. 8.

Dioicous ?, the antheridial flowers not seen. Plants in deep silky tufts, dull green above, light brown below; stems 8 to 10 cm. long, branched, tomentose throughout; leaves spreading, often curved-secund, 8 to 10 mm. long, from an ovate base gradually narrowed to a long setaceous tubulose point, denticulate about one-third of the way down, entire below; costa about one-third the width of the leaf base, long-excurrent into a grooved denticulate hair point, in cross-section toward the apex showing a row of guide cells with stereid bands above and below, the outer cells differentiated, toward the base showing a row of guide cells with a thin stereid band on the ventral side and a wider band on the dorsal side composed of stereid cells interrupted by numerous larger cells almost equal in size to the guide row; alar cells reddish or hyaline, fugacious; lower basal cells short-rectangular, thin-walled and hyaline toward the costa forming a distinct area extending obliquely from near the margin to the costa, changing

abruptly to the linear pitted cells of the rest of the base; cells of the upper lamina elongate, linear with rounded ends, the marginal row elongate-rhomboidal.

TYPE: On tree, Cerro de las Caricias, north of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 11, 1926, no. 52296. Also from the following localities: Cerro de las Lajas, no. 51647; Cerros de Zurqui, nos. 50492, 50284, 50491a; Cerro de las Caricias, no. 52234.

This species is near *D. denudatum* (Brid.), but is surely distinct in the slender elongated stems and longer leaves, and especially in the sharply defined area of hyaline basal cells, which is very distinct from the adjacent linear, pitted chlorophyllose cells that make up the rest of the leaf base.

Metzlerella longiseta (Hook.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **10**: 191. 1924.

Cerro de las Vueltas, nos. 43761, 43864; Laguna de la Chonta, no. 42284; near Finca la Cima, no. 42790; Cerros de Zurqui, no. 50273.

DISTRIBUTION: Costa Rica; northern South America.

Metzlerella costaricensis (C. M.) Broth. in Engler & Prantl, Pflanzenfam. ed. 2. **10**: 191. 1924.

Santa Maria de Dota, nos. 42512, 43169; Quebradillas, no. 43010; near Finca la Cima, no. 42554; Laguna de la Chonta, no. 42203.

DISTRIBUTION: Mexico; Costa Rica; Guatemala.

KEY TO COSTA RICAN SPECIES OF HOLOMITRIUM

Stem leaves spreading from the insertion; alar cells 100 μ high or less, indistinct. **H. terebellatum.**

Stem leaves with an erect, more or less clasping base; alar cells 200 μ high or more, distinct.

Upper leaf cells elongate, up to 20 μ long.

Upper leaves 12 to 15 mm. long; costa long-excurrent ---- **H. longifolium.**

Upper leaves less than 7 mm. long; costa short-excurrent or vanishing.

Leaves 5 to 7 mm. long; lamina unistratose ---------- **H. standleyi.**

Leaves 4 to 4.5 mm. long; lamina irregularly bistratose --- **H. williamsi.**

Upper leaf cells short-rectangular to quadrate, up to 10 μ long -- **H. arboreum.**

Holomitrium terebellatum C. M. in Ren. & Card. Bull. Soc. Bot. Belg. 31[1]: 151. 1893.

Yerba Buena, no. 50101; vicinity of Orosi, no. 39849; El Muñeco, no. 50911; Zurqui, no. 48261; Cerro de las Caricias, no. 52213; La Hondura, no. 37563a.

DISTRIBUTION: Costa Rica.

Holomitrium longifolium Hampe, Ann. Sci. Nat. V. Bot. **3**: 364. 1865.

Yerba Buena, no. 50055.

DISTRIBUTION: Colombia. Not previously recorded from Central America.

Holomitrium standleyi Bartr., sp. nov. FIG. 9.

Autoicous ?, the antheridial flowers not seen. Fertile plants in dense, yellowish green tufts, brown below; stems branching, up to 4 cm. long, tomentose below; upper stem leaves crowded, crispate when dry, about 6 mm. long, from a suberect oblong-ovate entire base about 2 mm. long, abruptly contracted to a linear-lanceolate serrulate acute point, the lower smaller and more remote; costa short-excurrent, obscurely toothed on the back near the apex, in cross-section near the middle showing a row of guide cells with stereid bands above and below, the outer cells differentiated; basal cells long and narrow, with thickened pitted walls, at the angles a nearly square, brownish alar group about 200 μ high, often hyaline on the inner side; median and upper cells rectangular with rounded corners, up to 20 μ long, shorter toward the margins, in straight rows with

furrows between, convex on the free surfaces; perichaetial leaves with long convolute-clasping bases, filiform-pointed, equaling or overtopping the mouth of the capsule; seta 1 cm. long; capsule cylindric, 3 mm. long; exothecal cells up to 50 μ long by 25 μ wide, averaging about 1 : 2; peristome teeth projecting about 350 μ above the rim, lanceolate, papillose, often split along the median line, dark red below, pale above; lid long-subulate, about as long as the capsule; calyptra cucullate.

TYPE: On tree, Quebrada Serena, southeast of Tilaran, Province of Guanacaste, Costa Rica, altitude about 700 meters, Paul C. Standley and Juvenal Valerio, January 27, 1926, no. 46271. Also from the following localities: Quebrada Serena, no 46260; La Tejona, no. 45933.

The elongate median and upper leaf cells of this species preclude *H. arboreum;* the erect, imbricated bases of the stem leaves are surely a distinctive character as compared with *H. flexuosum* from Mexico and South America, and the leaves are too short for *H. longifolium.*

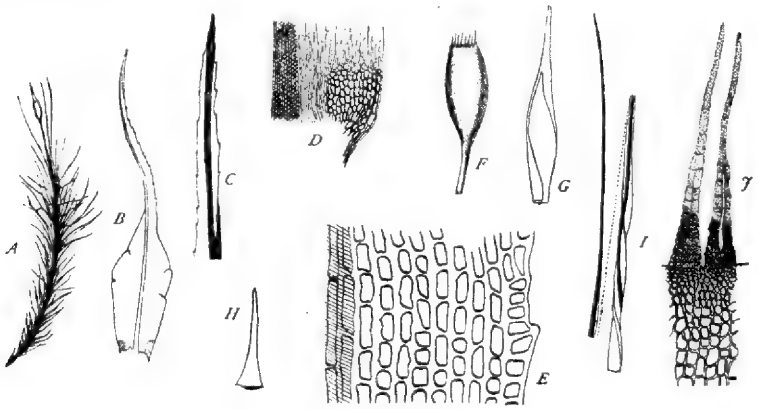

FIG. 9.—*Holomitrium standleyi* Bartr. *A*, fruiting plant, natural size; *B*, stem leaf, × 9; *C*, apex of leaf, × 42; *D*, one side of leaf base, × 42; *E*, one side of lamina from upper part of leaf, × 240; *F*, capsule, × 5.5; *G*, calyptra, × 5.5; *H*, lid, × 5.5; *I*, inner perichaetial leaf, × 5.5; *J*, part of peristome, × 82

Holomitrium williamsi Bartr., sp. nov. FIG. 10.

Dioicous? Plants in dense, yellowish green tufts, brown beneath; stems simple or sparingly branched, 2 to 3 cm. high, tomentose below, with dense clusters of short flagellate branches toward the ends; stem leaves about 5 mm. long, crispate when dry, abruptly narrowed to a lanceolate point from an erect-spreading entire oblong-obovate base nearly half the leaf length, serrulate about two-thirds of the way down; costa ending just below the rather blunt apex or percurrent, dentate on the back above, in cross section above the middle showing a row of 4 or 5 guide cells with stereid bands, on both sides and the outer cells differentiated; upper leaf cells short, oval or rounded-quadrate, about 5 μ wide by 5 to 8 μ long in two layers here and there on the margins and in spots through the lamina, the lower cells long and narrow, with thickened pitted walls, at the angles a large group of brownish alar cells extending about two-thirds of the way to the costa, the inner rows hyaline; leaves of the flagellate branches short and broad, obtuse or minutely apiculate, ecostate, closely appressed-imbricated. Sporophyte unknown.

TYPE: On tree, Yerba Buena, northeast of San Isidro, Province of Heredia, Costa Rica, altitude about 2,000 meters, Paul C. Standley and Juvenal Valerio, February 22 to 28, 1926, no. 49939.

Evidently close to *H. marginatum* Mitt., from Cuba, but with broader leaf points and the upper leaf cells bistratose only here and there on the margins and in spots through the lamina; the flagellate branches are also characteristic. Mr. Williams' studies in this and allied genera have helped so much to clarify our knowledge that it is a pleasure to associate his name with the present species.

Holomitrium arboreum Mitt. Journ. Linn. Soc. **12**: 58. 1869.

El Muñeco, nos. 33947, 33833, 50893.

DISTRIBUTION: Mexico; Central America; northern South America.

Dicranum frigidum C. M. Bot. Zeit. **17**: 219. 1859.

Volcan de Turrialba, nos. 35304, 35256, 35309; Cerro de las Vueltas, nos. 43571, 43645.

DISTRIBUTION: Mexico; Central America; South America.

Schliephackea meteorioides (R. S. Williams) Broth. in Engl. and Prantl, Pflanzenfam. ed. 2. **10**: 207. 1924.

Cerro de las Lajas, nos. 51606, 51601; La Hondura, no. 51811; Zurqui, no. 48215; Cerro de las Caricias, no. 52171, c. fr.; Cerros de Zurqui, nos. 50516, 50525.

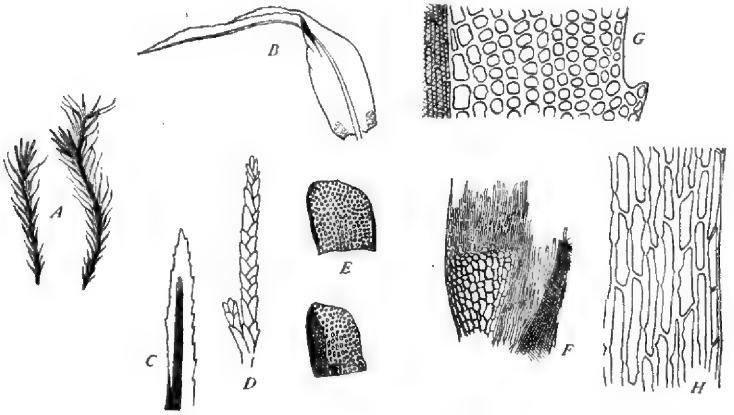

FIG. 10.—*Holomitrium williamsi* Bartr. *A*, two plants, natural size, one with lateral, the other with terminal clusters of flagellaceous branches; *B*, stem leaf, × 9; *C*, apex of leaf, × 42; *D*, flagellate branch, × 9; *E*, leaves from flagellate branch, × 42; *F*, one side of leaf base, × 42; *G*, one side of lamina from upper part of leaf, × 240; *H*, basal cells and margin just above alar group, × 240

DISTRIBUTION: Panama.

This is an especially instructive series of a rare species, known heretofore only from the type locality in Panama; and as the specimens under no. 52171 show the first mature capsules that have been found so far, it may be worth while to give a brief description of the peristome characters, which definitely place the plant in the genus *Schliephackea*, as surmised by Brotherus: Seta yellow, smooth, flexuous; capsule smooth, cylindric, 2.25 mm. long by 0.75 mm. wide; exothecal cells oval-rectangular, up to about 65 μ long by about 20 μ wide, with rather regular, yellowish-pellucid walls, smaller toward the mouth, 3 or 4 rows around the rim obscure, dark reddish brown; stomata few, in about two rows at the extreme base; peristome inserted below the mouth and projecting about 225 μ above the rim; teeth 60 μ wide at the base, tapering gradually to a blunt truncate apex, incurved, tawny red, coarsely papillose; articulations 10 to 12, thick, projecting on the edges, solid or indistinctly perforate along the median line; spores slightly rough, about 17 μ in diameter.

Dicranoloma brittonae Bartr., sp. nov. FIG. 11.

Dioicous? Stems up to 12 cm. high, without a distinct central strand, stiff, not or scarcely tomentose at the base, in loose, yellowish green tufts. Leaves 10 to 12 mm. long, spirally contorted at the tips when dry, widely spreading from a short clasping base, concave, gradually narrowed to a tubulose setaceous point, entire below, remotely denticulate toward the apex; costa narrow, indistinct below, about 75 μ wide, percurrent, slightly rough on the back near the apex, in cross-section showing a row of guide cells with narrow stereid bands above and below, the outer cells not differentiated; cells at the basal angles incrassate, brownish, forming a distinct alar group about 300 to 400 μ high and extending about two-thirds of the way to the costa; cells just above the alar group rather short and broad, quickly becoming narrower and longer upward, with thick pitted walls, several rows at the margins very long and narrow, not pitted, the median cells elongate with incrassate pitted walls up to 60 μ long by 10 μ wide,

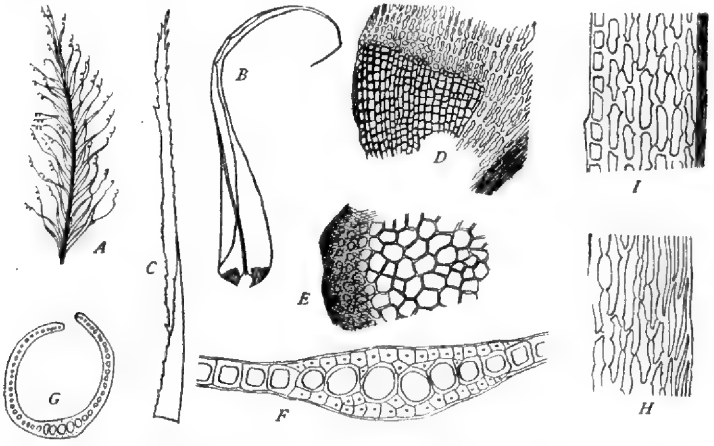

FIG. 11.—*Dicranoloma brittonae* Bartr. *A*, end of dry stem, natural size; *B*, stem leaf, moist, × 5; *C*, apex of leaf, × 42; *D*, one side of leaf base, × 42; *E*, part of cross section of stem, × 80; *F*, part of cross section from lower part of leaf, × 240; *G*, cross section from upper part of leaf, × 240; *H*, basal cells and margin, × 240; *I*, one side of lamina from upper part of leaf, × 240

gradually shorter upward, the marginal row in the upper part of the leaf rectangular or rhomboidal and distinct from the elongate inner lamina cells almost to the apex.

TYPE: On tree, Cerros de Zurqui, northeast of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 11, 1926, no. 50505. Also a few stems from Cerro de las Caricias, no. 52145b.

The generic position of this striking species is rather obscure, but in view of the elongate pitted upper leaf cells and narrow cells bordering the basal margins, none too distinct in some of the leaves, I have taken the liberty of provisionally including it in the genus *Dicranoloma*, with which it seems to be most closely affiliated. It is a privilege to have the opportunity of associating Mrs. Britton's name with this unique species, the first of the genus to be found north of the Isthmus of Panama, and I trust that more ample material may some day establish its exact relationship.

Dicranoloma setaceum Bartr., sp. nov. FIG. 12

Dioicous? Stems 4 to 5 cm. long, without a distinct central strand, flexuous, branched, tomentose throughout, in rather dense tufts; leaves up to 12 or 14 mm. long, curved-secund, linear-lanceolate from an oblong-ovate base, gradually narrowed to a long setaceous tubulose point, remotely denticulate about halfway down, entire below; costa rather indistinct below, about 200 μ wide, long-excurrent into a denticulate point with a few short teeth on the back near the apex, in cross-section showing a row of guide cells with stereid bands above and below, the outer cells clearly differentiated on the dorsal side; cells at the base reddish brown, incrassate, forming a band about 275 μ high extending obliquely from the margins to the costa, immediately above this band a few short pitted cells, quickly becoming longer and narrower upward with thick pitted walls, very long and narrow toward the margins but not forming a distinct border; median cells linear, with thick pitted walls; upper cells elongate, linear to irregularly rhomboidal, incrassate. Sporophyte unknown.

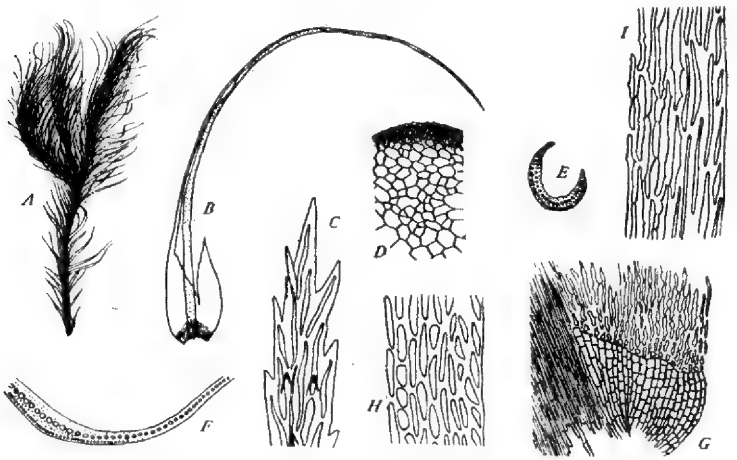

FIG. 12.—*Dicranoloma setaceum* Bartr. *A*, plant, natural size; *B*, stem leaf, × 5; *C*, apex of leaf, × 240; *D*, cross section of stem, × 80; *E*, cross section of leaf near apex, × 42; *F*, part of cross section of leaf from near base, × 80; *G*, one side of leaf base, × 42; *H*, median leaf cells and margin, × 240; *I*, basal cells and margin a little above the alar group, × 240

TYPE: Wet bank, Cerro de las Vueltas, Province of San Jose, Costa Rica, altitude 2,700 to 3,000 meters, Paul C. Standley and Juvenal Valerio, December 29, 1925, to January 1, 1926, no. 43537. Also from Cerro de las Vueltos, no. 43813.

The elongate pitted leaf cells, very long and narrow on the basal margins, seem to locate this plant in the genus *Dicranoloma*, where it may be left provisionally until more complete material is available.

Leucoloma serrulatum Brid. Bryol. Univ. **2**: 752. 1827.

Vicinity of Pejivalle, no. 47171a; El Muñeco, nos. 51082a, 51385; Yerba Buena, nos. 50047a, 50135, 49930; La Hondura, no. 36292; Naranjos Agrios, no. 46457; Cerro de las Caricias, no. 52159; Zurqui, no. 48250.

DISTRIBUTION: West Indies; Mexico; Guatemala.

Leucoloma crugerianum (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1870–71**: 412. 1872.

El Muñeco, no. 51013; vicinity of Fraijanes, no. 47653a.

DISTRIBUTION: Mexico; West Indies; northern South America.

Leucobryaceae

Ochrobryum obtusifolium Mitt. Journ. Linn. Soc. **12**: 108. 1869.

Santa Maria de Dota, nos. 41628, 41651, 43142.

DISTRIBUTION: South America.

These coll ctions are an exact match for specimens from South America, and extend the range of the species very considerably to the northward. The lanceolate channeled leaves, gradually narrowed to the apex, without any distinct base, are quite distinctive in comparison with the leaves of *O. gardnerianum*.

Leucobryum giganteum C. M. Syn. Musc. Frond. **1**: 79. 1849.

Cerro de las Caricias, no. 52228; Yerba Buena, no. 49864; Cerros de Zurqui, no. 50327; Cerro de las Lajas, no. 51644; La Estrella, no. 39402.

DISTRIBUTION: West Indies; Costa Rica; northern South America.

Leucobryum albicans (Schwaegr.) Lindb. Öfv. Svensk. Vet. Akad. Förh. **20**: 402. 1863.

La Palma, no. 38221; vicinity of Orosi, no. 39831; Cerro de la Carpintera, no. 34439; Cerro de las Caricias, no. 52172; Cerro de las Lajas, no. 51596.

DISTRIBUTION: Cuba; Costa Rica; South America.

Leucobryum albidum (Brid.) Lindb. Öfv. Svensk. Vet. Akad. Förh. **20**: 403. 1863.

Vicinity of Orosi, no. 39703a; Zurqui, no. 48278; Cerro de las Caricias, no. 52169.

DISTRIBUTION: Eastern North America; West Indies; Mexico; Guatemala.

Leucobryum crispum C. M. Syn. Musc. Frond. **1**: 78. 1849.

El Muñeco, nos. 33880, 51291; vicinity of Pejivalle, no. 46927.

DISTRIBUTION: West Indies; northern South America.

The first record for this species in Central America.

Leucobryum polakowskyi (C. M.) Card. Mém. Soc. Sci. Nat. Cherbourg **32**: 82. 1900.

La Hondura, nos. 36122, 36227a; La Estrella, no. 39271; Yerba Buena, no. 50112; vicinity of Fraijanes, no. 47430; Viento Fresco, no. 47952; Santa Maria de Dota, no. 43373.

DISTRIBUTION: Jamaica; Mexico; Central America.

Leucobryum martianum (Hornsch.) Hampe; C. M. Linnaea **17**: 317. 1843.

Vicinity of Pejivalle, no. 46970a; Finca Montecristo, no. 48483.

DISTRIBUTION: West Indies; northern South America.

The first record for Central America.

Leucobryum antillarum Schimp.; Besch. Ann. Sci. Nat. VI. Bot. **3**: 190. 1876.

Vicinity of Fraijanes, no. 47417; El Muñeco, nos. 50972, 50992; Cerros de Zurqui, no. 50343; Laguna de la Chonta, no. 42158; Las Nubes, nos. 38734, 38446; La Palma, no. 38221a; Yerba Buena, no. 49658; La Estrella, no. 39245; Laguna de la Escuadra, no. 42040.

DISTRIBUTION: West Indies; Mexico; Central America; northern South America.

Octoblepharum albidum (L.) Hedw. Descr. Musc. Frond. **3**: 15. 1791.

Vicinity of Tilaran, no. 44549; vicinity of Guapiles, no. 37397a; Finca Montecristo, no. 48577.

DISTRIBUTION: West Indies; Mexico; Central America and tropical regions generally.

Octoblepharum pulvinatum (Doz. & Molk.) Mitt. Journ. Linn. Soc. **12**: 109. 1869.

Hamburg Finca, no. 48727; Finca Montecristo, nos. 48430, 48526.

DISTRIBUTION: West Indies; northern South America.

The first record from Central America.

Octoblepharum erectifolium Mitt. N. Amer. Fl. 15: 162. 1913.

El Muñeco, no. 51240; Yerba Buena, nos. 49947, 49653; La Palma, no. 38161.

DISTRIBUTION: Jamaica; Trinidad.

The first record from Central America.

Octoblepharum mittenii Jaeg. Ber. St. Gall. Nat. Ges. 1871–72: 321. 1873.

La Hondura, no. 36233.

DISTRIBUTION: Eastern South America.

The plants from Costa Rica seem to be identical with the type material of the species from the Amazon region. It is very close to the preceding species, but I think they may be distinguished by the following particulars:

O. ERECTIFOLIUM Mitt.	O. MITTENII Jaeg.
Leaf base rather narrow and inconspicuous, about 1.5 mm. long or less, tapering at the apex; plants yellowish.	Leaf base broad, conspicuous, 2 to 3 mm. long, abruptly rounded at the apex; plants tinged with purple.

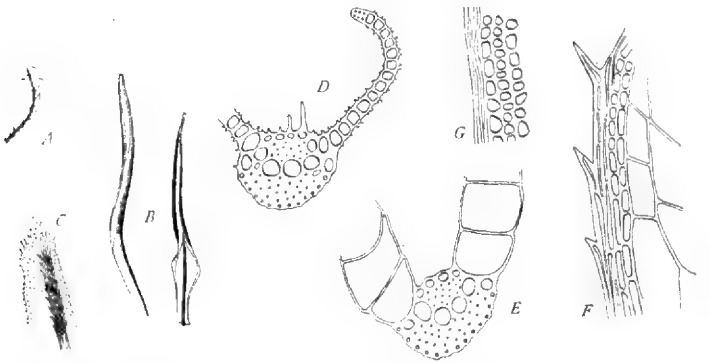

FIG. 13.—*Syrrhopodon cristatus* Bartr. *A*, dry plant, natural size; *B*, two stem leaves, × 9; *C*, apex of leaf, × 80; *D*, part of cross section from upper part of leaf, × 9; *E*, part of cross section from lower part of leaf, × 240; *F*, margin of leaf at shoulder, × 240; *G*, upper leaf cells and margin, × 240

Calymperaceae

Syrrhopodon berterianus (Brid.) C. M. Syn. Musc. Frond. 1: 535. 1849.

La Hondura, no 37836; vicinity of Guapiles, nos. 37138, 37213.

DISTRIBUTION: West Indies; northern South America.

Syrrhopodon incompletus Schwaegr. Suppl. 1²: 119. 1824.

Finca Montecristo, no. 48526a.

DISTRIBUTION: Florida; Mexico; West Indies; northern South America.

The specimens of this and the preceeding species seem to be the first records for Central America.

Syrrhopodon flavescens C. M. Syn. Musc. Frond. 1: 541. 1849.

La Estrella, no. 39377; vicinity of Orosi, no. 39786.

DISTRIBUTION: West Indies; Mexico; Central America; northern South America.

Syrrhopodon cristatus Bartr., sp. nov. FIG. 13.

Evidently dioicous. Stems short, simple, about 5 to 9 mm. high, in loose, pale green tufts; leaves 3 to 4 mm. long, linear-ligulate and tubulose from an erect shining white oblong-obovate base about one-third of the length of the leaf; apex blunt or short-acute; spinose-dentate on the margins and back just below the

point, bordered with a narrow band of hyaline stereid cells; margins remotely spinose-dentate to the apex of the cancellinae, then ciliate-dentate to below the leaf shoulders, entire at the extreme base; costa ending just below the apex, smooth on the back except at the apex, on the upper surface coarsely spinose from the apex to the top of the cancellinae, about 40 to 50 μ wide halfway up, in cross-section about mid-leaf showing a row of 6 guide cells with thick stereid bands on both sides and differentiated outer cells; leaf cells irregularly oval to transversely elongate, about 6 μ wide and up to 10 μ long, papillose on both surfaces with multifid papillae; cancellinae hyaline, short-rectangular, nearly filling the leaf base and ending in acute angles above. Sporophyte unknown.

TYPE: Yerba Buena, northeast of San Isidro, Province of Heredia, Costa Rica, altitude about 2,000 meters, Paul C. Standley and Juvenal Valerio, February 22 to 28, 1926, no. 49947a, in tufts of *Octoblepharum erectifolium*.

This neat little species is near *S. pusillus* Mitt., but characteristically distinct in the costa smooth on the back below the cristate, spinose apex, and in the leaf cells papillose with multifid papillae (not spiculose).

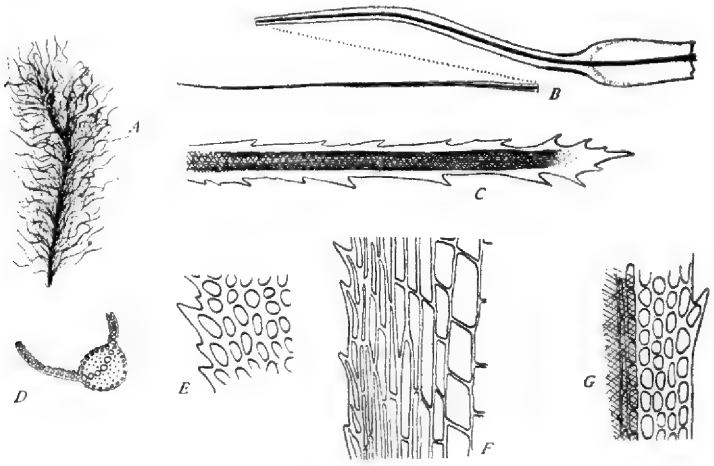

FIG. 14.—*Syrrhopodon therioti* Bartr. *A*, dry plant, natural size; *B*, leaf, in two parts, × 6; *C*, apex of leaf, × 80; *D*, part of cross section of leaf about halfway down, × 80; *E*, leaf cells and margin just above the shoulder, × 240; *F*, basal leaf cells and margin about halfway from the insertion to the shoulder, × 240; *G*, one side of lamina from upper part of leaf, × 240

Syrrhopodon therioti Bartr., sp. nov. FIG. 14.

Evidently dioicous. Plants in deep dense tufts, yellowish green above, light brown below; stems up to 10 cm. high, branched above; leaves 15 to 20 mm. long, filiform-acuminate from a short erect oblong-obovate base, grooved, not bordered; margins erect or incurved above the shoulders, serrulate to the base; costa red at the base, yellowish above, 90 to 130 μ wide at the apex of the cancellinae, ending just below the apex, about one-third to one-quarter the width of the upper leaf, smooth on both sides or more often with a few short remote teeth on the back toward the apex, in cross-section near the middle showing about 6 guide cells with thick stereid bands above and below, the outer layers larger and differentiated; upper cells distinct, oval or rounded-quadrate, 8 to 10 μ long by 6 to 8 μ wide, smooth on the dorsal side, indistinctly mammillose above; cancellinae nearly filling the leaf base, broadly rounded above, narrowly margined on the sides. Sporophyte unknown.

TYPE: On log, Cerro de las Lajas, north of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 7, 1926, no. 51472. Also from Cerro de las Lajas, nos. 51527, 51509b.

The long, filiform, pointed, unbordered leaves, serrulate to the base, and the robust habit characterize this striking species at a glance. It is a great pleasure to associate with it the name of my good friend M. Thériot, whose studies in the mosses of Costa Rica, and more lately in those of Mexico, have added so much to our knowledge of the flora of these regions.

Pottiaceae

Anoectangium euchloron (Schwaegr.) Mitt. Journ. Linn. Soc. **12**: 176. 1869.

Along Rio Reventado, no. 49430.

DISTRIBUTION: Mexico; Central America; West Indies; South America; Philippine Islands; Java.

Hymenostomum mexicanum Card. Rev. Bryol. **36**: 70. 1909.

Cerros de Candelaria, *Manuel Valerio* 30.

Pseudosymblepharis circinnata (Schimp.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **10**: 261. 1924.

Cerros de Zurqui, no. 50701.

DISTRIBUTION: Mexico.

Not previously known outside of Mexico.

Leptodontium filescens (Hampe) Mitt. Journ. Linn. Soc. **12**: 50. 1869.

Finca la Cima, No. 42777; Volcan de Turrialba nos. 35243a, 34953, 35160a, 35161a, 35013a.

DISTRIBUTION: Colombia; Mexico.

This little-known species has recently been detected among Brother Arsène's Mexican mosses by M. Thériot, and its occurrence in Costa Rica therefore fills in a gap between Mexico and the type locality in Colombia.

Leptodontium subgracile Ren. & Card. Bull. Soc. Bot. Belg. **31**[1]: 153. 1893.

Volcan de Turrialba, nos. 35251a, 35277; Cerro de las Vueltas, no. 43805.

DISTRIBUTION: Costa Rica.

Leptodontium ulocalyx (C. M.) Mitt. Journ. Linn. Soc. **12**: 51. 1869.

Las Nubes, no. 38467; Cerros de Zurqui, no. 50515a.

DISTRIBUTION: Mexico; Central America; northern South America.

Leptodontium sulphureum (C. M.) Mitt. Journ. Linn. Soc. **12**: 51. 1869.

La Estrella, no. 39145; Viento Fresco, no. 47964; Vicinity of Fraijanes, no. 47476b; Santa Maria de Dota, nos. 41616, 43177; Finca la Cima, no. 42588; Cerro de las Vueltas, no. 43946.

DISTRIBUTION: Mexico; Central America.

Leptodontium sulphureum (C. M.) Mitt. var. **motelayi** (Ren. & Card.) Bartr.

Leptodontium motelayi Ren. & Card. Bull. Soc. Bot. Belg. **38**: 11. 1899.

Cerro de las Caricias, no. 52126; Cerro de las Vueltas, nos. 43684, 43539; Yerba Buena, no. 49153; Zurqui, nos. 50277, 48073, 48106, 48133; La Estrella nos. 39331, 39481a; Volcan de Turrialba, nos. 34958, 35318; Cerro de las Lajas no. 51568.

DISTRIBUTION: Costa Rica; Panama.

The plants listed here show almost every possible gradation between the extreme with long-acuminate leaf points and the typically short-pointed leaf of the specific type. There are no other distinguishing characters that I have been able to find, and it seems obligatory to regard this form as of varietal rank only.

Leptodontium sulphureum (C. M.) Mitt. var. **flagellaceum** Bartr., var. nov. FIG. 15.

Differs from the species in the presence of axillary clusters of flagellate branches clothed with small oblong acute leaves, costate less than halfway up.

TYPE: On tree, Cerros de Zurqui northeast of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 3, 1926, no. 50508.

Hyophila tortula (Schwaegr.) Hampe, Bot. Zeit. **4**: 267. 1846.

Santa Maria de Dota, no. 43351a.

DISTRIBUTION: West Indies; northern South America; Costa Rica; Mexico; Arizona.

A cosmopolitan tropical American species that has been described under many different names.

Barbula bescherellei Sauerb. var. **stenocarpa** Card. Rev. Bryol. **37**: 126. 1910.

Finca la Cima, no. 42613.

DISTRIBUTION: Mexico.

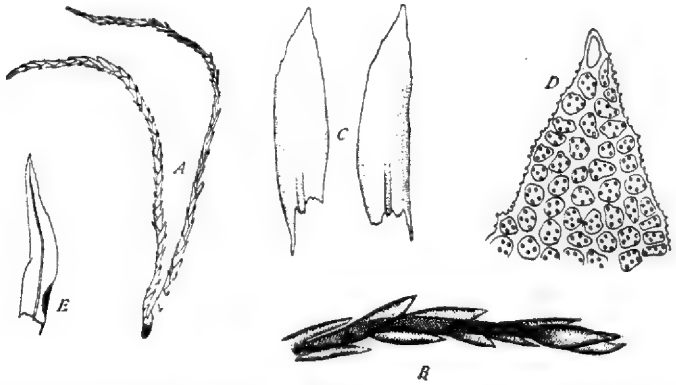

FIG. 15.—*Leptodontium sulphureum* (C. M.) Mitt. var. *flagellaceum* Bartr. *A*, two flagellate branches, × 6; *B*, tip of flagellate branch, × 40; *C*, two leaves from flagellate branch, × 80; *D*, apex of leaf from flagellate branch, × 240; *E*, stem leaf, × 6

Streptopogon rigidus Mitt. in Spruce Cat. Musc. Amaz. & And. **3**: 139. 1867 (nomen)

Viento Fresco, no. 47878c.

DISTRIBUTION: Costa Rica; South America; Madagascar.

Tortula caroliniana Andrews, Bryologist **23**: 72. 1920.

Cerro de Piedra Blanca, no. 32505a; along Rio Reventado, no. 49630a.

DISTRIBUTION: North Carolina; Mexico.

Both of the above numbers are represented by a few stray plants segregated from other mosses. They seem to be identical with specimens from Mexico cited by Doctor Andrews in his original paper.

Grimmiaceae

Rhacomitrium conterminum (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1872–73**: 273. 1874.

Cerro de las Vueltas, no. 43878.

DISTRIBUTION: Costa Rica.

The hair points in this collection, as in the type material, are crispate to about the same degree, possibly a trifle more so in this number, and it is quite possible that *R. conterminum* may be only a synonym for *Rhacomitrium crispipilum* (Tayl.) Jaeg., of South America.

Funariaceae

Funaria bonplandii (Brid.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 1[1]: 524. 1903.

Cerro de las Caricias, nos. 52133, 52298.

DISTRIBUTION: Peru; Brazil; Chile.

Funaria epipedostegia Card. Rev. Bryol. **36**: 109. 1909.

Las Nubes, no. 38407.

DISTRIBUTION: Mexico.

If there is any specific difference between this species and *F. longiseta* (Schimp.) Broth., the Costa Rican plants probably belong to *F. epipedostegia*, on account of the more perfectly developed peristome, but the variation in the shape of the capsules seems to be entirely too wide to permit of any satisfactory specific definition on this character alone.

Funaria calvescens Schwaegr. Suppl. 1[2]: 77. 1826.

Yerba Buena, no. 49673; between San Pedro de Montes de Oca and Curridabat, nos. 41257, 32871; Santa Maria de Dota, no. 41712, El Silencio, no. 44631; near Finca la Cima, no. 42757; Cerro de la Carpintera, no. 34255; Laguna de la Chonta, no. 42199; vicinity of Tilaran, no. 44477; Rio Birris, no. 35422.

DISTRIBUTION: Cosmopolitan in tropical and subtropical regions.

Splachnaceae

Tayloria scabriseta (Hook.) Mitt. Journ. Linn. Soc. **12**: 250. 1869.

Cerro de las Vueltas, no. 43672.

DISTRIBUTION: Colombia; Ecuador.

Known previously only from South America.

Bryaceae

Webera spectabilis (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1873–74**: 137. 1875.

Volcan de Turrialba, nos. 35101, 35244a.

DISTRIBUTION: Mexico; Central America; Colombia.

Webera papillosa (C. M.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **10**: 362. 1924.

Volcan de Poas, no. 34927.

DISTRIBUTION: West Indies; South America.

The Costa Rican specimens show two forms of propagula intermingled, i. e. (1) ovoid, short-stalked, brownish, septate; (2) fusiform, irregularly branched, pellucid.

Epipterygium immarginatum Mitt. Journ. Linn. Soc. **12**: 319. 1869.

Along Rio Reventado, no. 49544a.

DISTRIBUTION: Guatemala.

Brachymenium capillare Schimp. Mém. Soc. Sci. Nat. Cherbourg **16**: 194. 1872.

Vicinity of Fraijanes, no. 47652.

DISTRIBUTION: Mexico.

Brachymenium systylium (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1873–74**: 119. 1875.

Zurqui, no. 48125; Cerro de Piedro Blanca, no. 32550; vicinity of Fraijanes, no. 47500; La Ventolera, no. 34657; Between Aserri and Tarbaca, no. 34175.

DISTRIBUTION: Mexico.

Brachymenium spathulifolium Ren. & Card. Bull. Soc. Bot. Belg. **31**[1]: 164. 1893.

Viento Fresco, no. 47836.

DISTRIBUTION: Costa Rica.

Brachymenium viviparum Bartr., sp. nov. FIG. 16.

Dioicous? Stems loosely tufted, about 2 cm. long, radiculose at the base, simple or with short scattered branches; leaves ovate, acute, decurrent, erect and spirally twisted when dry, erect-speading when moist, not margined, entire; costa rather strong, excurrent into a short smooth point; upper cells rhomboidal-hexagonal, about 30 μ long by 12 μ wide, smooth, thin-walled, the lower rectangular and, on the average, narrower, several rows next to the costa on the

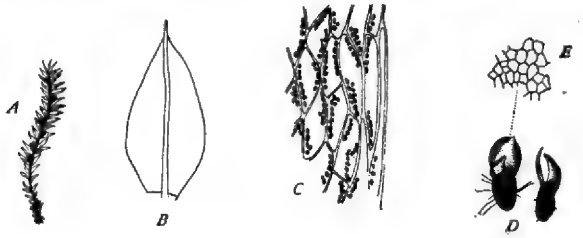

FIG. 16.—*Brachymenium viviparum* Bartr. *A*, moist plant, natural size; *B*, stem leaf, × 9; *C*, upper leaf cells and margin, × 240; *D*, axillary bulblets, × 9; *E*, areolation of bulblet leaves, × 42

dorsal side loose and spongy. Reproduction by means of numerous axillary conspicuous bulblets, about 1 mm. long, radiculose at the base and with 5 or 6 terminal, fleshy, ecostate, loosely areolate, incurved leaves.

TYPE: On tree, Los Ayotes, near Tilaran, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, Paul C. Standley and Juvenal Valerio, January 21, 1926, no. 45502.

The conspicuous axillary bulblets give this species a unique and characteristic appearance, even to the naked eye.

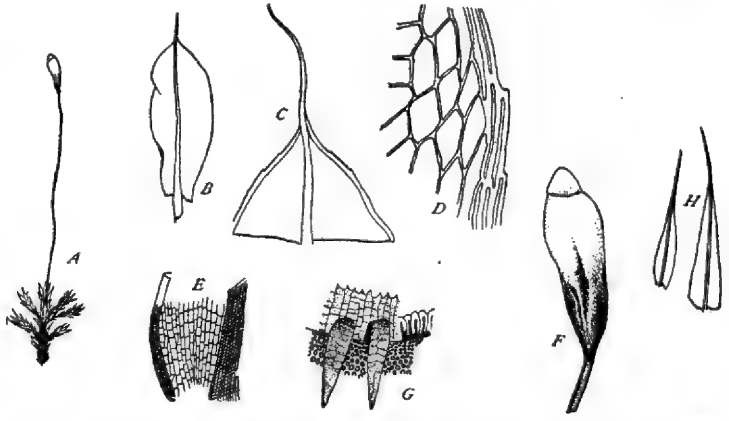

FIG. 17.—*Brachymenium standleyi* Bartr. *A*, plant, natural size; *B*, leaf, × 9; *C*, leaf apex, × 42; *D*, upper leaf cells and margin, × 240; *E*, one side of leaf base, × 42; *F*, moist capsule, × 6; *G*, part of peristome, × 42; *H*, inner perichaetial leaves, × 9

Brachymenium standleyi Bartr., sp. nov. FIG. 17.

Dioicous? Plants loosely cespitose, yellowish green above, light brown below; stems erect, about 1 cm. high, densely radiculose below; comal leaves crowded, erect-flexuous and contorted when dry, spreading when moist, 2.5 to 3 mm. long by 1.75 mm. wide, oblong-spatulate, abruptly contracted to an acute apex; upper leaf cells oval-hexagonal, about 37 μ long by 15 μ wide, becoming short-rectangular

toward the base, on the margins elongate, narrowly linear, forming a border 2 to 4 rows wide; margins narrowly revolute more than three-fourths of the way up, entire below, remotely denticulate toward the apex; costa reddish, tapering from a broad base, excurrent into a nearly smooth, yellowish hair point; lower leaves similar but smaller, remote; outer perichaetial leaves similar to the comal leaves but more narrowly acuminate, entire; inner leaves linear-subulate, not bordered; seta about 25 mm. long, erect, flexuous, yellowish; capsule erect, 4 mm. high, oblong-clavate, small-mouthed, with a tapering sulcate neck about equaling the body; outer peristome teeth reflexed against the wall of the capsule when dry, the inner a pale papillose cylinder, erose on the edge, about one-half as long as the teeth; lid small, conical, obtuse; annulus large; spores large, ovoid, up to 100 μ long by 40 μ wide.

TYPE: On tree, La Ventolera, on the southern slope of the Volcan de Poas, Costa Rica, altitude about 1,700 meters, Paul C. Standley, February 17 and 18, 1924, no. 34655.

This species seems to be clearly distinguished from all its congeners by the strongly reflexed peristome teeth and the unusually large spores.

Acidodontium megalocarpum (Hook.) Ren. & Card. Bull. Soc. Bot. Belg. 31: 162. 1892.

Viento Fresco, no. 47878; El Muñeco, no. 33571.

DISTRIBUTION: Colombia; Ecuador; Costa Rica.

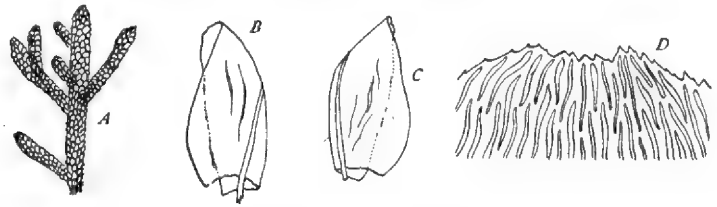

FIG. 18.—*Anomobryum costaricense* Bartr. *A*, moist plant, natural size; *B* and *C*, leaves, × 16; *D*, apex of leaf, × 240

These two numbers seem to be indistinguishable from typical South American specimens, and as there is more or less variation in the shape of the leaves I suspect that *A. floresianum* C. M. should be considered as a synonym of this species.

Anomobryum filiforme (Dicks., Lindb.) Husn. Musc. Gall. 222. 1888.

Volcan de Turrialba, no. 35292.

DISTRIBUTION: Europe; Africa; Costa Rica; South America.

Anomobryum costaricense Bartr., sp. nov. FIG. 18.

Dioicous. Stems 2 to 3 cm. high, with short claviform branches, pale glossy green, densely tufted and matted together with radicles below; leaves broadly oval, 1.2 mm. long, closely imbricated, concave, plicate, the apex truncate or emarginate; costa ending about three-fourths of the way up; upper cells elongate, linear-flexuous, incrassate, toward the base broader and more lax; margin plane, entire below, sharply denticulate toward the truncate apex. Sporophyte unknown.

TYPE: On exposed rock, vicinity of Santa Maria de Dota, Province of San Jose, Costa Rica, altitude 1,500 to 1,800 meters, Paul C. Standley and Juvenal Valerio, December 26, 1925, to January 3, 1926, no. 43154.

This species is characterized by the erose-denticulate, truncate or even emarginate leaf apices.

Bryum argenteum L. Sp. Pl. 1120. 1753.

Cerro de las Vueltas, no. 43605; near Finca la Cima, no. 42763.

DISTRIBUTION: Cosmopolitan.

Bryum argenteum L. var. **lanatum** B. & S. Bry. Eur. 6[9]: 7. *pl. 41*. 1839.

Santa Maria de Dota, no. 43170; vicinity of Tilaran, no. 44496; Volcan de Turrialba, nos. 35243, 35161.

DISTRIBUTION: Cosmopolitan, but more abundant in the warmer zones.

Bryum sordidum Hampe, Ann. Sci. Nat. V. Bot. **4**: 341. 1865.

El Muñeco, no. 51308.

DISTRIBUTION: Colombia.

Differs from the following in the oblong-ovate entire leaves and the slender flexuous innovations.

Bryum erythroneuron Mitt. Journ. Linn. Soc. **12**: 312. 1869.

Cerro de las Vueltas, no. 43964.

DISTRIBUTION: Colombia and Ecuador.

Bryum rosulicoma Ren. & Card. Bull. Soc. Bot. Belg. **31**[1]: 166. 1893.

Cerro de las Vueltas, no. 43538; El Muñeco, no. 33470a; Santa Maria de Dota, no. 41662.

DISTRIBUTION: Costa Rica.

Mniaceae

Mnium rostratum Schrad. in L. Syst. Nat. ed. 13. **2**[2]: 1330. 1791.

Cerro de Piedra Blanca, nos. 32517, 32525, 32529b; Laguna de la Escuadra, no. 41958a; Santa Maria de Dota, nos. 41662a, 42395, 41860, 41819, 43231, 41759; El Muñeco, no. 33512; Viento Fresco, nos. 47778, 47981; Cerros de Zurqui, no. 50274; Las Nubes, no. 38372; Cerro de la Carpintera, no. 34250; Quebradillas, nos. 42926, 42958; La Palma, no. 38052; vicinity of Fraijanes, no. 47512; Cerro de las Vueltas, no. 43783.

DISTRIBUTION: Temperate and subtropical regions generally.

Rhizogoniaceae

Rhizogonium spiniforme (L.) Bruch. Flora **29**: 134. 1846.

Cerro de las Lajas, no. 51420; Cerros de Zurqui, no. 50637; Viento Fresco, nos. 47952a, 47967; Yerba Buena, no. 49149; vicinity of Pejivalle, nos. 46970, 47169, 47020; vicinity of Fraijanes, nos. 47531, 47633; El Muñeco, nos. 50906a, 33936, 33932, 33492, 51089; La Estrella, no. 39398; El Silencio, no. 44697; La Hondura, no. 36311; Santa Maria de Dota, no. 41687; Laguna de la Chonta, no. 42243; Cerro de la Carpintera, no. 34358; vicinity of Orosi, no. 39838.

DISTRIBUTION: Common throughout the Tropics.

Rhizogonium mnioides (Hook.) Schimp. Bot. Zeit. **2**: 125. 1844.

Cerro de las Vueltas, nos. 43779, 43790, 43870, 43942, 43944.

DISTRIBUTION: South America; Australia; Tasmania; New Zealand.

Not previously known north of Colombia.

Rhizogonium lindigii (Hampe) Mitt. Journ. Linn. Soc. **12**: 328. 1869.

Cerro de las Caricias, nos. 52186, 52269; near Finca la Cima, no. 42743.

DISTRIBUTION: South America; Costa Rica (in herb. New York Bot. Gard.).

This neat and very characteristic little species does not seem to have been known before north of Colombia.

Aulacomniaceae

Leptotheca costaricensis Card. & Thér. Soc. Havraise Étud. Div. **88**: 308. 1921.

Cerros de Zurqui, nos. 50438, 50441, 50482; Volcan de Poas, no. 34923; Zurqui, nos. 48230, 48191.

DISTRIBUTION: Costa Rica.

Bartramiaceae

Leiomela bartramia (Hook.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 635. 1903.

Volcan de Turrialba, no. 35070a.

DISTRIBUTION: Jamaica; Colombia; Ecuador.

Bartramia defoliata C. M. Linnaea **33**: 597. 1864.

Cerro de las Vueltas, no. 43738.

DISTRIBUTION: Colombia.

Philonotis tenella (C. M.) Besch. Fl. Bry. Antill. Fr. 33. 1876.

La Hondura, nos. 51876, 51872; Los Ayotes, no. 45396; vicinity of Orosi, no 39607; along Rio Reventado, no. 49583; La Estrella, no 39296.

DISTRIBUTION: Florida; West Indies; Central America; South America.

Philonotis sphaericarpa (Swartz) Brid. Bryol. Univ. **2**: 25. 1827.

Yerba Buena, nos. 50075a, 49760a, 49655, 50106, 50113; La Hondura, nos 36194, 37609; vicinity of Pejivalle, no. 46731.

DISTRIBUTION: West Indies; South America.

Breutelia tomentosa (Swartz) Schimp. in Paris Ind. Bryol. 155. 1894.

Cerro de las Caricias, nos. 52165, 52130, 52143a; Cerros de Zurqui, nos. 50531, 50693, 50712, 50295, 50279a; Cerro de las Lajas, nos. 51550, 51419; La Palma, nos. 33195, 33178, 33194a; La Estrella, no. 33933; Yerba Buena, nos. 49147a, 49277; La Hondura, nos. 51905, 51868. Form with leaves falcate-secund: Las Nubes, no. 38409; La Hondura, no. 37692; Cerros de Zurqui, no. 50528.

DISTRIBUTION: Mexico; West Indies; South America.

The plants referred here to *B. tomentosa* form a very variable group, with the upper leaf margins varying from sharply serrate to obscurely sinuate; the upper leaf cells either long and narrow, with strongly incrassate walls, or shorter and less evidently thickened laterally; the papillae varying from low and rounded to sharp conical forms that give the leaf surface a very rough appearance; the costa may be percurrent or long-excurrent, and either sharply serrate or nearly smooth. It seems impossible to correlate definitely any of these characters, but there are two forms that stand out rather obviously: One with falcate-secund leaves comprising nos. 38409, 37692, and 50528, which may represent the same plant as the Mexican forms referred to by Thériot,[4] and the other with the stems slightly or not at all tomentose, comprising nos. 51550 and 51419 from Cerro de las Lajas.

Breutelia brittoniae Ren. & Card. Bull. Soc. Bot. Belg. 31^1: 161. 1893.

Las Nubes, no. 38670.

DISTRIBUTION: Costa Rica.

Breutelia chrysea (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1873–74**: 98. 1875.

Laguna de la Chonta, no. 42137; Cerro de las Vueltas, nos. 43551, 43688.

DISTRIBUTION: South America.

Orthotrichaceae

Zydogon pungens C. M. Bot. Zeit. **20**: 361. 1862.

El Muñeco, no. 33611a.

DISTRIBUTION: Guatemala; South America.

Zygodon reinwardtii (Hoch.) A. Br. Bry. Eur. IV. Mon. 9. 1838.

Volcan de Turrialba, no. 35156; Cerro de las Vueltas, no. 43841a.

DISTRIBUTION: Alaska; Mexico; South America; Java; Africa.

Zygodon liebmannii Schimp. in C. M. Syn. Musc. Frond. **1**: 673. 1849.

Volcan de Turrialba, no. 35070.

DISTRIBUTION: Mexico.

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[4] Smiths. Misc. Coll. 78^2: 20. 1926.

KEY TO COSTA RICAN SPECIES OF MACROMITRIUM

Capsule small-mouthed, sulcate above; peristome single. (GONIOSTOMA.)
M. didymodon.

Capsule wide-mouthed, smooth or striate; peristome generally double. (LEIOSTOMA.)

Leaves oblong-lingulate, obtuse and apiculate; basal cells short.
M. apiculatum.

Leaves lanceolate, acuminate; basal cells long.

Capsules plicate.

Seta rough.

Capsules strongly plicate—**M. longifolium.**

Capsules lightly plicate to smooth—**M. scleropelma.**

Seta smooth.

Leaf margins with hyaline teeth at the insertion.

Leaves 3 mm. long or more; secondary stems robust—**M. verrucosum**

Leaves 2.5 mm. long or less; secondary stems short.

Seta 8 mm. long; leaves oblong-lanceolate—**M. reflexifolium.**

Seta 4 mm. long; leaves linear-lanceolate—**M. guatemalense.**

Leaf margins without hyaline teeth—**M. attenuatum.**

Capsules smooth.

Upper leaf cells elongate, with narrow lumens.

Capsules cylindric; leaves 10 mm. long or less.

Leaves 10 mm. long, filiform-acuminate, squarrose-spreading.
M. fusco-aureum.

Leaves 5 to 7 mm. long, acuminate, erect-spreading.
M. subcirrhosum.

Capsules globose-pyriform.

Leaves less than 5 mm. long—**M. williamsi.**

Leaves 12 to 15 mm. long—**M. standleyi.**

Upper leaf cells short.

Leaves 5-ranked, acute—**M. pentastichum.**

Leaves not ranked, acuminate.

Leaf cells mammillose.

Seta 4 to 5 mm. long; capsule 1.5 mm. long—**M. hirtellum.**

Seta 10 mm. long or more; capsule 2 mm. long.
M. mammillosum.

Leaf cells smooth or nearly so.

Upper leaf cells round-quadrate, in rows—**M. costaricense.**

Upper leaf cells oval, not in rows, incrassate.

Median cells in straight rows with furrows between.
M. palmense.

Median cells not in straight rows.

Leaves about 3 mm. long, crispate-cirrhate when dry.[5]

Leaves erect-spreading when moist; seta 15 mm. long or less—**M. cirrhosum.**

Leaves squarrose-spreading when moist; seta up to 25 mm. long—**M. werckleanum.**

Leaves 5 mm. long or more.

Leaves about 5 mm. long, flexuose when dry.
M. tonduzii.

Leaves 7 to 10 mm. long, crispate-cirrhate when dry.
M. fuscescens.

[5] *M. barbense* Ren. & Card. seems to belong here.

Macromitrium didymodon Schwaegr. Suppl. 2^2: 138. *pl. 190.* 1827.

Along Rio Reventado, no. 49387.

DISTRIBUTION: Brazil; Bolivia.

Not known before from north of Brazil.

Macromitrium apiculatum (Hook.) Brid. Bryol. Univ. 1: 311. 1827.

Vicinity of Tilaran, nos. 44346, 44404; Hamburg Finca, no. 48696a; La Tejona, no. 45921; along Rio Reventado, no. 49422; San Isidro Coronado, February 19, 1924, *Anastasio Alfaro.*

DISTRIBUTION: Mexico; Central America; South America.

Macromitrium longifolium (Hook.) Brid. Bryol. Univ. 1: 309, 738. 1827.

Viento Fresco, no. 47829b; Las Nubes, no. 38488; near Finca la Cima, no. 42719; vicinity of Fraijanes, no. 47757; Laguna de la Chonta, no. 42301.

DISTRIBUTION: Central America; South America.

Macromitrium verrucosum Bartr., sp. nov. FIG. 19.

Autoicous? Primary stems slender, bare, creeping, the secondary erect, 3 to 4 cm. high, in rather dense tufts, dichotomously branched, brownish and radiculose below, yellowish green above; leaves 2.5 to 3 cm. long, oblong-lanceolate,

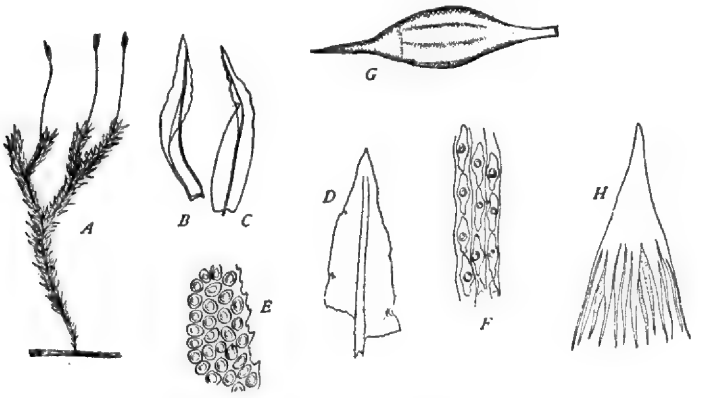

FIG. 19.—*Macromitrium verrucosum* Bartr. *A*, moist plant, natural size; *B* and *C*, stem leaves, × 8; *D*, apex of leaf, × 42; *E*, upper leaf cells and margin, × 240; *F*, median leaf cells, × 240; *G*, dry capsule, × 8; *H*, calyptra, × 8

acute or short-acuminate, carinate, cirrhate-crisped when dry, squarrose-spreading when moist; margins undulate and serrulate about one-third of the way down, plane and entire below; costa ending just below the apex; upper leaf cells oval or rounded, about 12 μ in diameter, often larger toward the costa and smaller toward the margins, strongly mammillose on both surfaces, toward the base elongate, narrowly linear, verrucose with high conical tubercles; perichaetial leaves similar, with longer upper cells, especially toward the margins, and less strongly mammillose; seta about 1 cm. long, pale red, smooth; capsule ovoid, about 2 mm. high without the lid, tapering to a short neck, with 6 or 7 distinct ribs extending from the rim to the base; peristome double, of two concentric papillose cylinders about 0.225 mm. high, irregularly cleft on the edges; lid slenderly rostrate, about as long as the capsule; spores papillose up to 30 μ in diameter.

TYPE: On tree, oak forest near Quebradillas, about 7 km. north of Santa Maria de Dota, Province of San Jose, Costa Rica, altitude about 1,800 meters, Paul C. Standley, December 24, 1925, no. 43023. Also from Finca la Cima, no. 42596.

This species seems to approach *M. tortuosum* most closely, but is distinct in the upper leaf cells, which are nearly twice as large and more strongly mammillose; the leaves are also more sharply acute and the upper margins more strongly undulate. The tall secondary stems separate the species from *M. rhystophyllum* C. M., the longer, acutely pointed leaves from *M. reflexifolium* Mitt., and the longer seta from *M. guatemalense* C. M.

Macromitrium reflexifolium Mitt. Journ. Linn. Soc. **12**: 211. 1869.

Santa Maria de Dota, no. 41677.

DISTRIBUTION: Guatemala.

Macromitrium guatemalense C. M. Syn. Musc. Frond. **2**: 644. 1851.

Santa Maria de Dota, no. 43471.

DISTRIBUTION: Guatemala.

Macromitrium fusco-aureum Bartr., sp. nov. FIG. 20.

Dioicous? Primary stems creeping, the secondary robust, in dense tufts up to 6 cm. long, branched, without radicles, glossy dark brown below, lurid yellowish green above; leaves 8 to 10 mm. long, narrowly linear-lanceolate, long subulate-

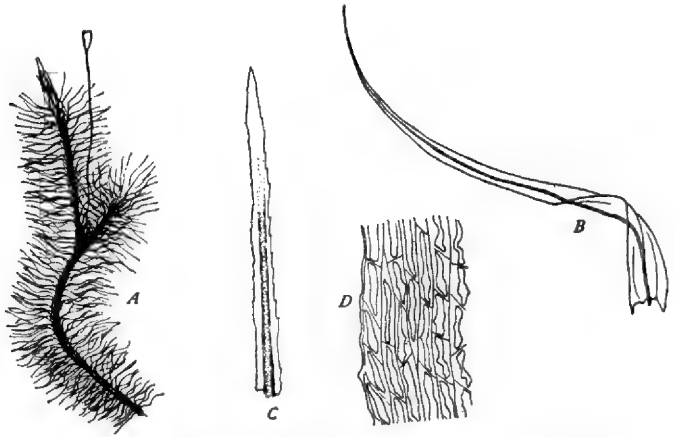

FIG. 20.—*Macromitrium fusco-aureum* Bartr. *A*, moist plant, natural size; *B*, leaf, × 5.5; *C*, apex of leaf, × 42; *D*, upper leaf cells and margin, × 240

acuminate, widely flexuous-spreading and spirally contorted when dry, abruptly squarrose-spreading from a short erect plicate clasping base when moist; leaf cells all elongate and smooth, the upper about 35 to 40 μ long, with irregularly thickened lateral walls, pitted, the median similar, with more evident intermediate furrows, the lower long and narrow, with strongly pitted, yellowish-pellucid walls; basal margin entire and narrowly recurved, plane above, remotely serrulate in the upper half; seta 2 cm. long, reddish; capsule cylindric, 2 mm. long, wide-mouthed, smooth, gradually tapering to a short neck; peristome unknown (the only capsule seen is old and imperfect).

TYPE: On tree, Cerros de Zurqui, northeast of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 3, 1926, no. 50403.

This species is somewhat similar to *M. subcirrhosum* C. M., but the habit is much more robust and the leaves are nearly twice as long, from an erect clasping base, and are much more slenderly acuminate. In reality, the only characters the two plants have in common are the elongate leaf cells and cylindric capsules.

Macromitrium subcirrhosum C. M. Bot. Zeit. **20**: 373. 1862. FIG. 21.

Cerro de las Caricias, no. 52145; Cerros de Zurqui, nos. 50335, 50381, 50419, 50373; Yerba Buena, no. 50050a.

DISTRIBUTION: Costa Rica.

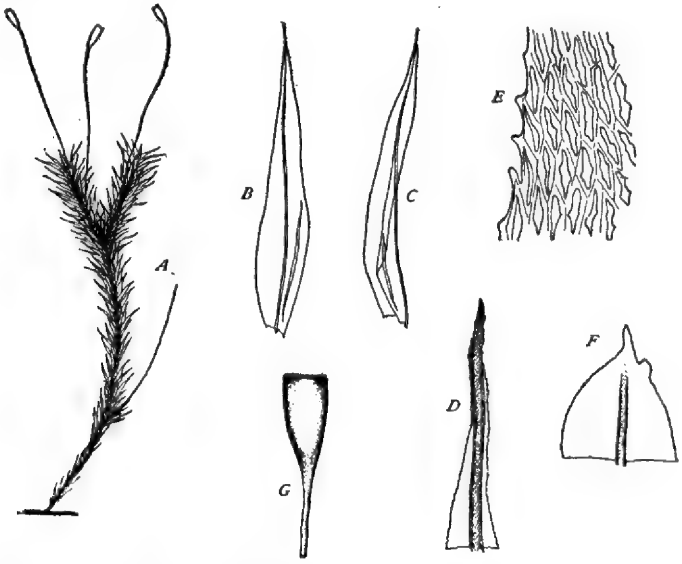

FIG. 21.—*Macromitrium subcirrhosum* C. M. *A*, moist plant, natural size; *B* and *C*, stem leaves, × 6; *D*, apex of stem leaf, × 42; *E*, upper leaf cells and margin, × 240; *F*, apex of inner perichaetial, leaf, × 42; *G*, dry capsule, × 5.5

Macromitrium williamsi Bartr., sp. nov. FIG. 22.

Autoicous? Primary stems creeping, bare, the secondary erect, short, 15 to 20 mm. high, radiculose, branched, in rather loose, yellowish green tufts, brown below; comal leaves about 5 mm. long, the lower about 4 mm. long, linear-lanceolate, acuminate, erect, flexuose and spirally contorted when dry, spreading when moist, carinate and lightly plicate in the lower half, denticulate about halfway

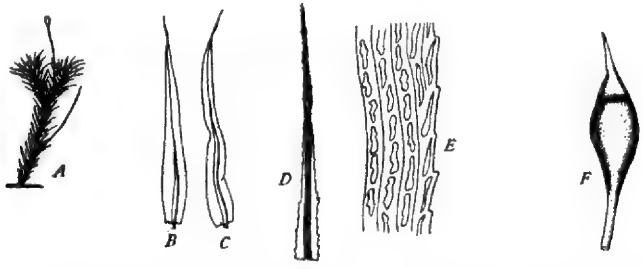

FIG. 22.—*Macromitrium williamsi* Bartr. *A*, moist plant, natural size; *B* and *C*, stem leaves, × 8; *D*, apex of stem leaf, × 42; *E*, upper leaf cells and margin about one-third down, × 240; *F*, moist, operculate capsule, × 8

down; costa excurrent into a short denticulate yellowish hair-point; leaf cells elongate, the upper in rows, smooth, averaging about 18 μ long, with narrow lumens; lateral walls incrassate, sinuate and pellucid, with evident furrows between the rows; median cells longer, up to 30 μ long, in rows with intermediate furrows, the lower cells narrowly linear, with thick yellowish-pellucid walls, verrucose with rather low, rounded papillae; perichaetial leaves shorter and broader

than the stem leaves; upper cells shorter and smaller, the basal cells smooth; costa percurrent or short-excurrent; seta red, smooth, 8 to 10 mm. long; capsule ovoid, smooth, about 1.25 mm. long, short-necked; peristome double, of concentric papillose cylinders about 75 μ high, the outer split about one-quarter of the way down, the inner paler, irregularly cleft; lid rostrate, about equaling the capsule; calyptra smooth, without hairs (immature).

TYPE: On tree, La Hondura, Province of San Jose, Costa Rica, altitude 1,300 to 1,700 meters, Paul C. Standley, March 24, 1924, no. 36405.

This species is smaller than *M. flavopilosum* R. S. Williams, with more slenderly acuminate leaves, shorter and more denticulate hair-points, and the upper cells in rows with intermediate furrows. *M. scoparium* Mitt. is a much more robust plant with larger leaves and the upper cells not in rows, and *M. ulophyllum* Mitt., from South America, has a seta twice as long, the median leaf cells in oblique rows, and the leaves more distinctly bordered with narrow cells in the upper half.

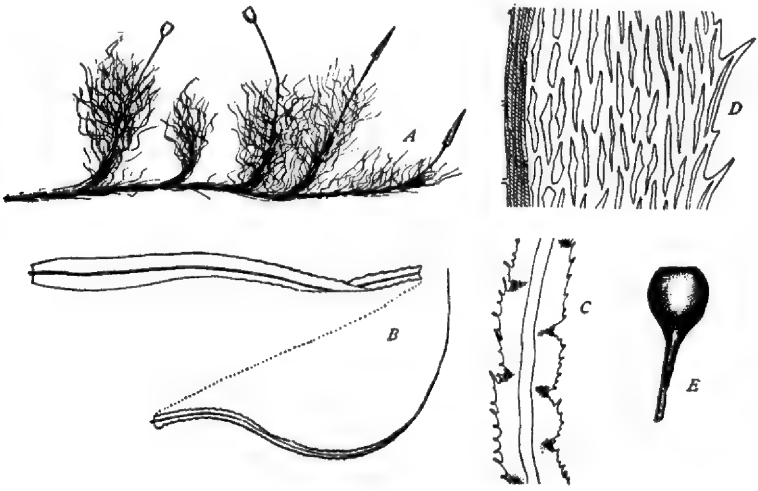

FIG. 23.—*Macromitrium standleyi* Bartr. *A*, end of stem, natural size; *B*, branch leaf, × 6; *C*, section from upper part of leaf, × 40; *D*, one side of lamina from upper part of leaf, × 240; *E*, dry capsule, × 6

Macromitrium standleyi Bartr., sp. nov. FIG. 23.

Autoicous; antheridial buds gemmiform, in small clusters on the ventral side of the nerve of the primary stem leaves. Primary stems creeping, 15 cm. long, or more, slender, without radicles; leaves closely imbricated, appressed or secund toward the ends; secondary branches about 2 cm. long, simple, golden brown, densely foliate; leaves up to 17 to 18 mm. long, flexuose-spreading, more or less distinctly secund, narrowly linear-lanceolate, very gradually narrowed to a long filiform-acuminate point; costa red, excurrent into a long denticulate hair-point; margins strongly undulate-crisped in the upper two-thirds, irregularly ciliate-dentate about halfway down, denticulate to the base; leaf cells elongate, the upper and median about 40 μ long, with narrow lumens and pitted incrassate walls, longer and narrower toward the margins, smooth, the lower long and narrow, with thick yellowish-pellucid walls, strongly verrucose with knoblike papillae; seta about 2 cm. long, red, smooth; capsule globose-pyriform, reddish brown, about 1.75 mm. long by 1.50 mm. wide, abruptly contracted to a short sulcate neck; peristome evidently double (capsules all old and imperfect); lid unknown; calyptra (immature) smooth, without hairs, laciniate at the base.

TYPE: On tree, Cerro de las Caricias, north of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 11, 1926, no. 52147. Also from Cerro de las Caricias, no. 52247.

This beautiful species is characterized at sight by the long, undulate-crisped, ciliate-dentate leaves, the tawny color, and the elongate stems with short remote branches. What I assume to be the primary stems are evidently prostrate; the leaves in the older parts are closely appressed and more or less abraded, in the median and terminal parts loosely flexuose-spreading and secund.

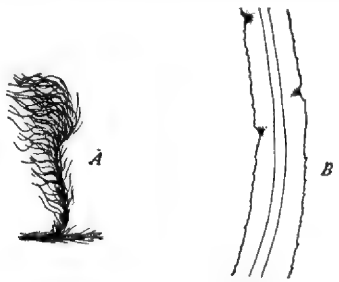

FIG. 24.—*Macromitrium standleyi* Bartr. var. *subundulatum* Bartr. *A*, stem and branch, natural size; *B*, section from upper part of leaf, × 42

Macromitrium standleyi Bartr. var. **subundulatum** Bartr., var. nov. FIG. 24.

Similar to the species but with the branch leaves more strongly secund, less undulate in the upper half, and only denticulate on the upper margins (not ciliate-dentate as in the species).

TYPE: On tree, Cerro de las Caricias, north of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 11, 1926, no. 52096.

Macromitrium pentastichum C. M. Syn. Musc. Frond. 1: 731. 1849.

La Colombiana Farm, no. 36892; Hamburg Finca, no. 48704.

DISTRIBUTION: Mexico; West Indies; South America.

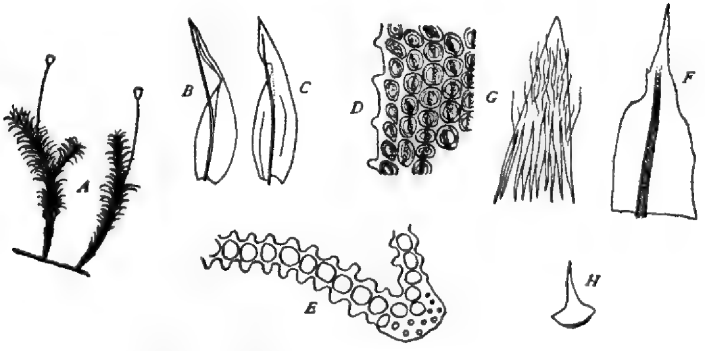

FIG. 25.—*Macromitrium hirtellum* Bartr. *A*, moist plant, natural size; *B* and *C*, two stem leaves, × 8; *D*, upper leaf cells and margin, × 240; *E*, part of cross section from upper part of leaf, × 240; *F*, apex of perichaetial leaf, × 40; *G*, calyptra, × 8; *H*, lid, × 8

Macromitrium hirtellum Bartr., sp. nov. FIG. 25.

Autoicous; antheridial buds gemmiform on the ventral side of the nerves of the older leaves. Primary stems creeping, bare, the secondary erect, sparingly branched, about 2 cm. high, radiculose at the base, in rather loose, yellowish

green tufts; leaves 3 mm. long, oblong-lanceolate, short-acuminate, erect and flexuosely contorted when dry, flexuose-spreading when moist, carinate, serrulate about halfway down; costa short-excurrent; upper leaf cells rounded-quadrate, hardly incrassate, mammillose on both surfaces, up to 12 μ in diameter, gradually elongated toward the base, in rows with intermediate furrows, the lowest cells linear, smooth; perichaetial leaves up to 5 mm. long, linear-lanceolate, abruptly contracted to a linear denticulate point; costa excurrent; cells in the lower two-thirds of the leaf elongate, in rows with furrows between; walls unequally thickened and pitted, gradually becoming shorter, rounded and mammillose toward the apex; seta 6 to 8 mm. long, red, smooth; capsule globose-pyriform, about 1.75 mm. high, smooth, abruptly contracted to a short sulcate neck; peristome not seen (capsules all too old); lid rostrate from a convex base, about 1 mm. long; calyptra laciniate at the base, long-pilose.

TYPE: On tree, Quebrada Serena, southeast of Tilaran, Province of Guanacaste, Costa Rica, altitude about 700 meters, Paul C. Standley and Juvenal Valerio, no. 46257, January 27, 1926.

This species is readily separated from *M. mammillosum* by the shorter seta, smaller capsule, and especially by the pilose calyptra.

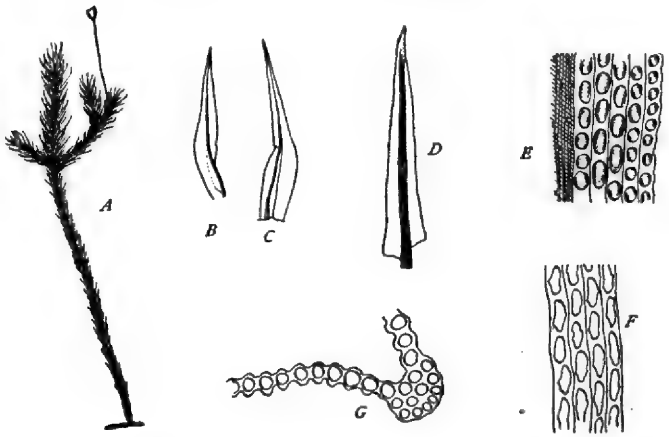

FIG. 26.—*Macromitrium mammillosum* Bartr. *A*, moist plant, natural size; *B* and *C*, stem leaves, × 8; *D*, apex of stem leaf, × 42; *E*, one side of lamina from upper part of leaf, × 240; *F*, median leaf cells, × 240; *G*, part of cross section from upper part of leaf, × 240

Macromitrium mammillosum Bartr., sp. nov. FIG. 26.

Autoicous? Primary stems creeping, bare, the secondary erect, branched above, 5 to 6 cm. high, dark brown in the older parts, yellowish green above, in loose tufts; leaves 2.5 to 3 mm. long, lanceolate, acuminate, lightly plicate, carinate, serrulate about halfway down, flexuous-crisped when dry, erect-spreading when moist; upper leaf cells elliptic, very incrassate, in rows with evident furrows between, up to 16 or 18 μ long toward the costa, shorter and nearly round toward the margins, mammillose on both sides, the median cells in rows with intermediate furrows, elongate, with thickened pitted walls, smooth, the lower cells linear, smooth or with a few low rounded papillae on the upper surface; costa percurrent, or vanishing just below the apex; perichaetial leaves similar but about 4 mm. long and more slenderly acuminate; seta 12 to 15 mm. long, smooth, flexuous; capsule about 2 mm. high, globose-pyriform, smooth, abruptly contracted to a short sulcate neck; lid and peristome unknown; calyptra smooth, without hairs, deeply laciniate at the base.

TYPE: On tree, Cerros de Zurqui, northeast of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley and Juvenal Valerio, March 3, 1926, no. 50384.

This species and *M. hirtellum* form a distinct group characterized by the short mammillose upper leaf cells. In habit they closely resemble *M. cirrhosum*, but under a microscope the upper leaf cells are very different.

Macromitrium costaricense Bartr., sp. nov. FIG. 27.

Autoicous? Primary stems bare, creeping, the secondary erect, branched, somewhat radiculose below, about 2 cm. high, in dense tufts, yellowish green above, brownish beneath; leaves 3 to 3.25 mm. long, linear-lanceolate, short-acuminate, serrulate toward the apex, entire below, carinate and lightly plicate in the lower half, cirrhate-crisped when dry, flexuose-spreading when moist; upper leaf cells short, rounded-quadrate or rhomboidal, thin-walled, about 7 to 10 μ in diameter, smooth, in straight rows, the median leaf cells oval-rectangular, somewhat larger, in rows with evident intermediate furrows, the lower cells long and narrow, with thick yellowish-pellucid sinuate walls nearly smooth or with a few low rounded obscure papillae; costa excurrent into a short denticulate point; perichaetial leaves about 4 mm. long, narrower than the stem leaves, more slenderly acuminate; costa longer excurrent and the cells more elongate;

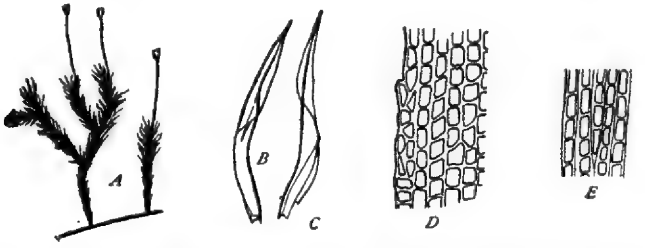

FIG. 27.—*Macromitrium costaricense* Bartr. *A*, moist plant, natural size; *B* and *C*, two stem leaves, × 8; *D*, upper leaf cells and margin, × 240; *E*, median leaf cells, × 240

seta 8 to 10 mm. long, red, smooth; capsule ovoid, contracted to a short sulcate neck, about 1.5 mm. long; peristome double; lid rostrate, a little shorter than the capsule; calyptra smooth, without hairs, laciniate to about the middle in the lower part.

TYPE: On tree, La Palma, Province of San Jose, Costa Rica, Paul C. Standley, March 17, 1924, no. 38023.

This species has the facies of *M. cirrhosum*, but the upper leaf cells are dense, in straight rows, and not at all incrassate, and the median leaf cells in rows with intermediate furrows.

Macromitrium palmense R. S. Williams, Torreya **14**: 25. 1914.

La Hondura, no. 37628a.

DISTRIBUTION: Costa Rica.

Macromitrium cirrhosum (Hedw.) Brid. Bryol. Univ. **1**: 316, 738, 798. 1827.

Vicinity of Fraijanes, nos. 47472, 47490, 47757a, 47452; Cerro de la Carpintera, nos. 35628, 34474, 34359; La Estrella, no. 39399; Los Ayotes, no. 45356; Cerros de Zurqui, nos. 48041a, 50616a, 50502; Alto de la Estrella, no. 39073; Yerba Buena, nos. 49131, 49970, 50070, 49066, 49190, 49137; between Aserri and Tarbaca, nos. 34200, 34116; Cerro de las Caricias, no. 52213a; La Hondura, nos. 37653, 51822; vicinity of Fraijanes, nos. 47490, 47757a, 47452; Quebrada Serena, no. 46230.

DISTRIBUTION: West Indies; Guatemala; South America.

Macromitrium werckleanum Thér. Soc. Havraise Etud. Div. **88**: 307. 1921.

Cerros de Zurqui, no. 50515; Zurqui, no. 48124; Yerba Buena, no. 50050; La Hondura, no. 51799.

DISTRIBUTION: Costa Rica.

This species is very close to *M. cirrhosum* but may be specifically distinct in the longer seta and squarrose direction of the leaves on the moist plants. The spiral ranking of the leaves is a difficult character to determine satisfactorily, judging from my own experience, and some of the plants of *M. cirrhosum* with erect-spreading leaves and short setae show this arrangement just as clearly. *M. cirrhosum* is apparently a common and rather variable species in Costa Rica, and some of the more robust forms with longer setae are difficult to separate satisfactorily from this species.

Macromitrium tonduzii Ren. & Card. Bull. Soc. Bot. Belg. **31**[1]: 155. 1892.

La Hondura, nos. 51843, 37885a, 36458; La Colombiana Farm, no. 36571; Yerba Buena, no. 49939b; Cerro de las Caricias, no. 52168; Cerro de la Carpintera, nos. 35600, 35588; Cerros de Zurqui, nos. 50440, 50550; La Palma, nos. 37983, 38019, 32919, 33030, 33220.

DISTRIBUTION: Costa Rica.

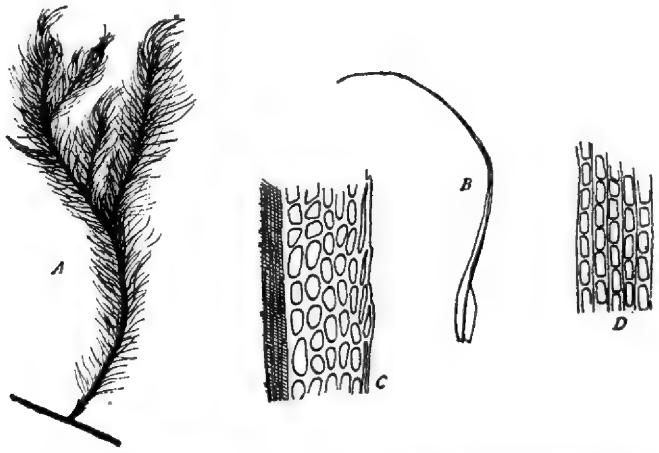

FIG. 28.—*Macromitrium fuscescens* Bartr. *A*, moist plant, natural size; *B*, stem leaf, × 5.5; *C*, one side of lamina from upper part of leaf, × 240; *D*, median leaf cells, × 240

Macromitrium fuscescens Bartr., sp. nov. FIG. 28.

Dioicous? Primary stems creeping, rather rough with old abraded leaves, dark brown, the secondary erect, densely tufted, 5 to 6 cm. high, tawny, yellowish green above, dark brown below, branched, scarcely radiculose toward the base; leaves 7 to 10 mm. long, linear-lanceolate, rather abruptly spreading from a short, suberect, lightly plicate base, gradually long filiform-acuminate, more or less falcate toward the ends, flexuose-spreading, crisped and contorted when dry, widely flexuose-spreading when moist, carinate, rather sharply denticulate toward the apex, sinuate-denticulate in the median and lower portions; costa reddish, excurrent into a long flexuous denticulate yellowish hair-point; upper leaf cells short, elliptic or rounded-quadrate, smooth, the marginal row elongate; median leaf cells rectangular, with rounded corners, in rows with evident intermediate furrows; lower cells long and narrow, with thick pitted yellowish-pellucid walls, smooth. Sporophyte unknown.

TYPE: On tree, La Palma, Province of San Jose, Costa Rica, altitude about 1,800 meters, Paul C. Standley, March 17, 1924, no. 38011.

Very different in color and habit from *M. subcirrhosum*, with much longer, narrower leaves, and clearly distinct from *M. fusco-aureum* by the short rounded upper leaf cells.

Micromitrium schlumbergeri Schimp. Mém. Soc. Sci. Nat. Cherbourg **16**: 191. 1872.

Vicinity of Tilaran, no. 44427; vicinity of San Jose, altitude about 1,150 meters, no. 33267.

DISTRIBUTION: Mexico.

This species was previously known only from Mexico.

Micromitrium lamprocarpum (C. M.) Par.

La Hondura, no. 36351; Dulce Nombre, no. 35809; La Ventolera, no. 34573; La Estrella, no. 39552; La Colombiana Farm, no. 36571a; Santa Maria de Dota, no. 42532; Viento Fresco, no. 47829; Yerba Buena, no. 49135; Quebradillas, no. 42952; vicinity of Tilaran, no. 44362.

DISTRIBUTION: Costa Rica.

Rhacopilaceae

Rhacopilum tomentosum (Swartz) Brid. Bryol. Univ. **2**: 719. 1827.

Finca las Concavas, no. 41446a; Quebrada Serena, no. 46252; La Hondura no. 36616; Cerro de Piedra Blanca, nos. 32504, 32513; El Muñeco, nos. 33617, 33611d, 33470; vicinity of Tilaran, nos. 44343, 44455; Cerro de la Carpintera, no. 35528; Santa Maria de Dota, nos. 43351, 42431.

DISTRIBUTION: Cosmopolitan in tropical and subtropical regions.

Hedwigiaceae

Rhacocarpus apiculatus (Ren. & Card.) Par. Ind. Bryol. 1068. 1894–98.

Volcan de Barba, *Manuel Valerio* 40.

Rhacocarpus humboldtii (Hook.) Lindb. Öfv. Svensk. Akad. Förh. 603. 1863.

Cerro de las Vueltas, no. 43609.

DISTRIBUTION: Mexico; South America; Africa.

Crypheaceae

Cryphea nitidula Schimp. Mém. Soc. Sci. Nat. Cherbourg **16**: 213. 1872.

Viento Fresco, no. 47878b.

DISTRIBUTION: Mexico; Costa Rica.

Leucodontaceae

Pseudocryphea flagellifera (Brid.) E. G. Britton, Bull. Torrey Club. **32**: 261. 1905.

Vicinity of Tilaran, no. 46658.

DISTRIBUTION: Florida; West Indies; Central America; South America.

Lepyrodontaceae

Lepyrodon tomentosus (Hook.) Mitt. var. **latifolius** Bartr., var. nov. FIG. 29, A.

Distinguished from the species by the broader leaves, abruptly narrowed to a rather short, subulate-acuminate point.

TYPE: On tree, Cerro de las Vueltas, Province of San Jose, Costa Rica, altitude 2,700 to 3,000 meters, Paul C. Standley and Juvenal Valerio, December 29 1925 to January 1, 1926, no. 43841.

Although the plants in this number are not at all characteristic of the species, I have given them varietal rank until further material is available. The costa ending about mid-leaf, or double and shorter with unequal forks, precludes *Lepyrodontopsis*, but the leaves are much broader and shorter in the point than in typical material of *L. tomentosus* from South America. This seems to be the first record for the genus north of South America.

Prionodontaceae

Key to Costa Rican Species of Prionodon

Secondary stems usually lax, elongate and pinnately branched--**P. luteovirens.**
Secondary stem shorter, more strict, simple or forked.
Leaves squarrose-spreading when moist; cells of the basal angles elongate, 1:4 or 6----------**P. fusco-lutescens.**
Leaves erect-spreading when moist; cells of the basal angles short, 1:1 or 2.
Median and upper leaf cells elongate and strongly porose------**P. lozanoi.**
Median and upper leaf cells short and hardly porose----------**P. densus.**

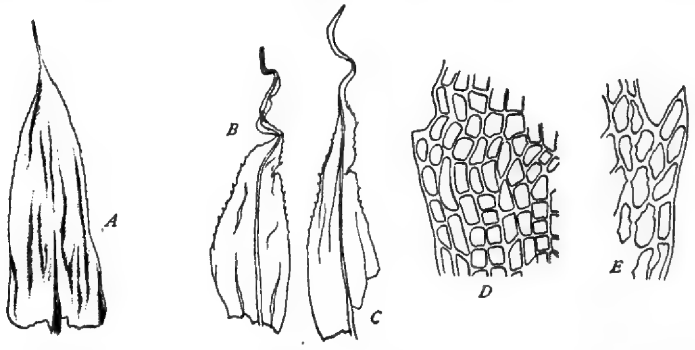

Fig. 29.—*Lepyrodon tomentosus* (Hook.) Mitt. var. *latifolius* Bartr. *A*, stem leaf, × 16. *Prionodon densus* (Swartz) C. M. var. *crispatulus* Bartr. *B* and *C*, two stem leaves, × 5.5; *D*, upper leaf cells and margin, × 240; *E*, median leaf cells and margin, × 240

Prionodon luteovirens (Tayl.) Mitt. Journ. Linn. Soc. **12**: 417. 1869.

Cerro de las Lajas, no. 51509c; La Palma, nos. 38168c, 38244; Zurqui, no. 48179; Cerro de las Vueltas, nos. 43696, 43593, 43546, 43543.

Distribution: Ecuador; Bolivia.

I have been utterly unsuccessful in the attempt to find any specific characters of value that might distinguish this species from any of the following: *Prionodon laeviusculus* Mitt.; *P. longissimus* Ren. & Card.; *P. patentissimus* Besch. Mr. Standley's series seems to break down definitely the specific distinctions between these species, and they are, to my mind, all forms of the one type which ranges from Costa Rica southward to Bolivia.

Prionodon fusco-lutescens Hampe, Ann. Sci. Nat. V. Bot. **4**: 356. 1865.

La Palma, nos. 33219, 38005, 32925; Volcan de Turrialba, no. 35026; La Estrella, no. 39443; Alto de la Estrella, no. 39131; Viento Fresco, no. 47765; Laguna de la Chonta, no. 42316; Cerro de las Vueltas, no. 43825; Cerros de Zurqui, no. 50536; La Hondura, no. 51812.

Distribution: Colombia; Bolivia.

This, like the preceding species, seems to find its northern limit of distribution in the mountains of Costa Rica. There do not seem to be any distinctive characters separating it from *P. divaricatus* Mitt., and I believe the latter name should be reduced to synonymy.

Prionodon densus (Swartz) C. M. Bot. Zeit. **2**: 129. 1844.

La Hondura, nos. 51837, 37744, 37895; Laguna de la Escuadra, no. 41919; Santa Maria de Dota, no. 41814 (forma); Volcan de Turrialba, no. 35012, 35130; La Palma, no. 38078; Viento Fresco, nos. 47907, 47919; El Muñeco, nos. 33577, 33493b; vicinity of Fraijanes, nos. 47588a, 47601a; between Aserri and Tarbaca, nos. 34122, 41392a; Cerro de la Carpintera, nos. 34247, 35528a, 34250a.

DISTRIBUTION: Mexico; Central America; South America; West Indies.

This seems to be a common and very variable moss in Costa Rica. The leaves from different collections, and even in the same number, vary considerably in outline, and it is impossible to draw any satisfactory line of demarcation between the typical form and the plant described by Thériot under the name *Prionodon mexicanus*. I have segregated the extremes of this form, and another variant with crispate leaves, as varieties, but it is questionable whether they are anything more than forms of a very polymorphic species. *Prionodon densus* normally has simple stems, but in the above series some of the plants are irregularly, or even pinnately branched; the stem leaves are abruptly narrowed from an oblong or ovate base to the almost linear point, which is fragile and coarsely and irregularly dentate on the margins; branch leaves narrower, more gradually acuminate from a narrower base, coarsely dentate, or even ciliate-dentate with teeth composed of 3 to 5 cells and laciniate toward the apex; upper and median leaf cells oval to rhomboidal, rather short, unipapillate on the back, or often on both surfaces in the young leaves; the marginal rows more elongate, rectangular to linear and smooth with straight pellucid walls (the inner cells are sometimes slightly porose but rarely conspicuously so); marginal cells at the basal angles short, nearly isodiametric, with very angular, porose walls.

Prionodon densus (Swartz) C. M. var. **mexicanus** (Thér.) Bartr.

Prionodon mexicanus Thér. Smiths. Misc. Coll. **78**[2]: 24. 1926.

Volcan de Turrialba, no. 35069; Laguna de la Chonta, no. 42292; along the Rio Reventado, no. 49487a.

Prionodon densus (Swartz) C. M. var. **crispatulus** Bartr., var. nov. FIG. 29, B–E

Differentiated from typical *P. densus* by the strongly crisped leaf points.

TYPE: On tree, between Aserri and Tarbaca, Province of San Jose, Costa Rica, altitude 1,600 to 1,900 meters, Paul C. Standley, February 12, 1924, no. 34171.

Pterobryaceae

Pterobryopsis mexicana (Schimp.) Fleish. Hedwigia **45**: 60. 1905.

Santa Maria de Dota, no. 43252.

DISTRIBUTION: Mexico.

Orthostichidium pentagonum (Hamp. & Lor.) C. M. in Bull. Herb. Boiss. **1897**: 205. 1897.

El Muñeco, nos. 33493, 51094; El Arenal, no. 45240.

DISTRIBUTION: Mexico; Costa Rica; Ecuador.

Orthostichopsis tetragona (Swartz) Broth. in Engl. & Prantl, Pflanzenfam. **1**[3]: 805. 1909.

Vicinity of Capulin, no. 40162; Naranjos Agrios, no. 46380; vicinity of Tilaran, no. 44405; Hamburg Finca, nos. 48688, 48730.

DISTRIBUTION: Mexico; Central America; northern South America; West Indies.

Pireella mariae (Card.) Card. Rev. Bryol. **40**: 17. 1913.

Cerro de la Carpintera, nos. 34249, 34284.

DISTRIBUTION: Costa Rica.

Pterobryum angustifolium (C. M.) Mitt. Journ. Linn. Soc. **12**: 426. 1869.

La Tejona, no. 45927; El Silencio, no. 44618; Naranjos Agrios, no. 46404.

DISTRIBUTION: West Indies; Colombia.

Not previously known from Central America. This species is very clearly distinguished from *P. densum* by the almost entire branch leaves, plicate only at the base and with the costa percurrent; also by the lower stem leaves, which are abruptly squarrose from a clasping base, as compared with the squamiform appressed leaves of *P. densum*.

Pterobryum densum (Schwaegr.) Hornsch. in Mart. Fl. Bras. **1**: 50. 1840.

Yerba Buena, nos. 49690, 49878; Cerro de la Carpintera, nos. 34500, 34247a; vicinity of Orosi, nos. 39755, 39865; Viento Fresco, no. 47885; Laguna de la Chonta, no. 42144; vicinity of Fraijanes, nos. 47601c, 47594, 47699; Laguna de la Escuadra, nos. 41923, 42041; Zurqui, no. 48093.

DISTRIBUTION: Mexico; Central America; South America.

Some of the plants listed above are lax in habit, with long flexuose branches and rather distant, narrow, slenderly acuminate leaves, but there is no difference in the sporophyte characters, and they are evidently all forms of one specific type.

Meteoriaceae

Squamidium nigricans (Hook.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 808. 1909.

La Tejona, no. 45933a; La Hondura, no. 51832; Hamburg Finca, no. 48695; El Silencio, no. 44801; Los Ayotes, no. 45493.

DISTRIBUTION: Mexico; South America; West Indies.

Squamidium longipilum (Schimp.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 809. 1909.

Las Nubes, no. 38424.

DISTRIBUTION: Guadeloupe; Costa Rica.

Squamidium macrocarpum (Schimp.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 809. 1909.

Vicinity of Tilaran, no. 44391; El Muñeco, no. 33611b.

DISTRIBUTION: Costa Rica; Peru.

Pilotrichella rigida (C. M.) Besch. Mém. Soc. Sci. Nat. Cherbourg **16**: 222. 1872.

Cerro de Piedra Blanca, no. 32514; Alto de la Estrella, no. 39077; La Colombiana Farm, no. 36813; Zurqui, no. 48271; La Ventolera, nos. 34654, 34670; vicinity of Tilaran, nos. 44363, 44342; La Estrella, no. 39256; between Aserri and Tarbaca, nos. 41335, 41392, 34052; El Silencio, nos. 44692, 44646; vicinity of Fraijanes, nos. 47453, 47634, 47588b, 47601; along Rio Reventado, nos. 49480, 49501; Santa Maria de Dota, nos. 42835, 41736; Quebradillas, no. 42951; vicinity of Pejivalle, nos. 47143, 47153; Laguna de la Escuadra, no. 41981; Yerba Buena, no. 49662; El Muñeco, nos. 33486, 33421, 51092, 33544, 33552, 51037, 50955; Los Ayotes, nos. 45513, 45533, 45489.

DISTRIBUTION: Mexico; Guatemala; Costa Rica.

A very common and variable species, at least in Costa Rica. I have a suspicion that this species, together with *P. viridis*, *P. hexasticha*, *P. pulchella*, and probably some others, form a closely related group that might, without much violence to natural laws, be united into one composite type. The spiral arrangement of the branch leaves is a rather intangible character, and the more lax, elongated forms that are described under the name *P. pulchella* pass so imperceptibly into the plants with shorter and more rigid branches that it seems impossible to separate them.

Pilotrichella pulchella Schimp. Mém. Soc. Sci. Nat. Cherbourg **16** :222. 1872.

Laguna de la Escuadra, no. 42075; vicinity of Fraijanes, no. 47705.

DISTRIBUTION: Mexico; Guatemala; Costa Rica.

The two collections listed above are simply the extremes of the series noted under the previous species.

Pilotrichella flexilis (Swartz) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 258. 1877.

Zurqui, no. 48229b; Cerros de Zurqui, no. 50502a; Cerro de las Vueltas, no. 43544a; La Palma, no. 32969a; El Muñeco, nos. 33675, 50882, 33582; Cerro de la Carpintera, no. 35586; Volcan de Turrialba, no. 35082; between Asserri and Tarbaca, nos. 34176, 34136; vicinity of Orosi, nos. 39817, 39857; vicinity of Fraijanes, no. 47448; Quebradillas, no. 42982; Cerro de las Caricias, nos. 52022b, 52175; Yerba Buena, nos. 49090, 49197; Santa Maria de Dota, no. 41635; Finca las Concavas, no. 41487; vicinity of Pejivalle, no. 47059.

DISTRIBUTION: Mexico; Central America; South America; West Indies.

Pilotrichella flexilis (Swartz) Jaeg. var. **robusta** Broth.

Vicinity of Fraijanes, no. 47657; Laguna de la Chonta, no. 42309; Cerro de las Vueltas, nos. 43867, 43692; Cerros de Zurqui, nos. 50360, 50498a; Volcan de Turrialba, no. 35307; Cerro de la Carpintera, no. 35718; La Palma, no. 38007.

DISTRIBUTION: Same as the species.

KEY TO THE COSTA RICAN SPECIES OF PAPILLARIA

Leaves with long capillary hair-points ..... **P. deppei.**

Leaves without capillary hair-points.

Leaves loosely imbricated when dry, strongly auricled at the base.

Leaf auricles large, inflated, incised-serrate ..... **P. oerstediana.**

Leaf auricles smaller, sulcate, serrate ..... **P. imponderosa.**

Leaves closely imbricated when dry; base cordate.

Leaf cells elliptic; secondary stems often with flagelliform branches. **P. appressa.**

Leaf cells linear; secondary stems without flagellae ..... **P. nigrescens.**

Papillaria deppei (Hornsch.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 264. 1877.

Cerro de la Carpintera, nos. 34266, 35526; Cerro de Piedra Blanca, no. 32528; near Carmen Station, no. 48353; along Rio Reventado, no. 49439; between Aserri and Tarbaca, no. 34109; vicinity of Cartago, no. 33354; Los Ayotes, no. 45431; Zurqui, nos. 48128, 48151.

DISTRIBUTION: Mexico; Central America; West Indies.

Papillaria oerstediana (C. M.) Jaeg. Ber. St. Gall. Ges. **1875–76**: 266. 1877.

Alto de la Estrella, no. 39323; Viento Fresco, no. 47880; El Muñeco, no. 33682; Yerba Buena, no. 50120; Cerros de Zurqui, no. 50527; vicinity of Fraijanes, no. 47491.

DISTRIBUTION: Costa Rica.

The distinction between this and the following species is by no means obvious. The form with large, erose-margined, incurved leaf auricles is referred here, but as the shape and size of these auricles varies considerably, even on the same stem, the distinction is by no means satisfactory, and I suspect they may represent only forms of one species.

Papillaria imponderosa (Tayl.) Broth. in Engl. & Prantl, Pflanzenfam. **1**[1]: 815. 1909.

El Muñeco, no. 33493c; Santa Maria de Dota, no. 41742b; Viento Fresco, no. 47869; Yerba Buena, no. 49683; Cerro de las Caricias, no. 51992; Cerros de Zurqui, no. 50462.

DISTRIBUTION: Mexico; Central America; South America.

Papillaria appressa (Hornsch.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 266. 1877.

Dulce Nombre, no. 35919; El Silencio, no. 44570; along Rio Reventado, nos. 49533, 49630; Hamburg Finca, no. 48696; vicinity of Pejivalle, no. 46738; La Tejona, no. 45944.

DISTRIBUTION: Mexico; Costa Rica; South America.

Papillaria nigrescens (Swartz) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 265. 1877.

Vicinity of San Jose, no. 47332; vicinity of Zapote, no. 40274; La Colombiana Farm, no. 36894; along Rio Maria Aguilar, no. 38949; El Muñeco, nos. 51127 (forma), 33470c.

DISTRIBUTION: Southern United States; Mexico; Costa Rica; South America; China.

Meteorium undulifolium Broth. & Thér. Soc. Havraise Étud. Div. **88**: 311. 1921.

Cerro de las Lajas, no. 51487; El Muñeco, nos. 33552a, 33767a; Santa Maria de Dota, no. 42375a (forma); Quebradillas, no. 43019a; La Estrella, no. 39333a; vicinity of Pejivalle, no. 47021a, 47158.

DISTRIBUTION: Costa Rica.

This species is very close to *M. illecebrum* (C. M.) Mitt., but may be distinct in the narrower leaf cells with more incrassate lateral walls, and in the more strongly undulate margins.

Lindigia aciculata (Tayl.) C. M. Linnaea **42**: 402. 1879–81.

La Estrella, no. 39202a.

DISTRIBUTION: Western South America; Costa Rica.

Barbella tenuissima (Hook. & Wils.) Fleisch.

Vicinity of Fraijanes, no. 47705b; El Muñeco, no. 33493a; Viento Fresco, nos. 47880a, 47933a; Zurqui, no. 48229; Cerro de las Caricias, no. 52003.

DISTRIBUTION: Costa Rica; western South America.

Meteoriopsis remotifolia (Hornsch.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 825. 1906.

Vicinity of Pejivalle, nos. 47153a, 47114; El Muñeco, no. 33484a.

DISTRIBUTION: Mexico; Costa Rica; South America.

Meteoriopsis patula (Swartz) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 825. 1906.

Along Rio Reventado, no. 49594; Finca Montecristo, no. 48569.

DISTRIBUTION: Mexico; Central America; South America; West Indies.

Meteoriopsis patula (Swartz) Broth. var. **congesta** Bartr., var. nov.

Distinguished at sight by the densely pinnate-branched stems with short crowded branches.

TYPE: On tree, Los Ayotes, near Tilaran, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, Paul C. Standley and Juvenal Valerio, January 21, 1926, no. 45530. Also from La Tejona, no. 45944a; vicinity of Tilaran, nos. 44391a, 44341.

The short congested branches of these collections, all from the vicinity of Tilaran, give the plants a very different appearance from the species, but as no other distinguishing characters have been found, it seems preferable to combine them with the type until sporophyte characters are available.

Phyllogoniaceae

Phyllogonium fulgens (Swartz) Brid. var. **viride** (Brid.) Bartr.

Phyllogonium viride Brid. Bryol. Univ. **2**: 673. 1827.

El Muñeco, no. 50916; Yerba Buena, no. 50090; Zurqui, nos. 48041, 48260; vicinity of Fraijanes, no. 47515.

DISTRIBUTION: Mexico; Central America; South America; West Indies.

Phyllogonium fulgens (Swartz) Brid. var. **gracile** Ren. & Card. Bull. Soc. Bot. Belg. **41**: 80. 1902–3.

La Palma, nos. 33079, 38143, 37997; El Muñeco, no. 33929; Yerba Buena, no. 49855; Las Nubes, no. 38723; La Hondura, no. 36615; Alto de la Estrella, no. 39130; Zurqui, no. 48063a; Cerros de Zurqui, no. 50507; Cerro de las Lajas, no. 51508; Cerro de las Caricias, nos. 52174, 52162a.

DISTRIBUTION: Costa Rica.

Phyllogonium viscosum (Palis.) Mitt. Journ. Linn. Soc. **12**: 423. 1869.

La Hondura, no. 37711; Las Nubes, no. 38857; La Estrella, no. 39195; La Palma, nos. 38017, 32969, 32921; Cerro de la Carpintera, nos. 35585, 35630, 34410, 34449; Laguna de la Chonta, no. 42352; Cerro de las Lajas, no. 51494; El Muñeco, nos. 50890, 50978, 51113, 33776, Zurqui, no. 48267.

DISTRIBUTION: Mexico; Central America; northern and western South America.

Eucatagonium politum (Hook. & Wils.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 178. 1925.

Cerro de las Vueltas, no. 43764a.

DISTRIBUTION: Western South America; Australia; Tasmania; New Zealand.

Neckeraceae

Calyptothecium turgescens Broth. & Thér. Soc. Havraise Étud. Div. **88**: 312. 1921.

Rio Reventado, nos. 49436, 49577, 49541, 49485, 49439a; between Aserri and Tarbaca, no. 34119; Cerro de Piedra Blanca, no. 32530; Santa Maria de Dota, nos. 43238, 43125.

DISTRIBUTION: Costa Rica.

This endemic species seems to differ constantly from *C. duplicatum* (Schwaegr.) Broth. in the more tumid stems and branches with obtuse tips, and in the cochleariform leaves with numerous cylindrical propagula in the axils toward the ends of the branches and occasionally along the secondary stems. These propagula are present in the type material of the species, and occur in all of the Costa Rican collections, usually in abundance. In *C. duplicatum* the leaves are distichous and the stems and branches very flat, while in *C. turgescens* the leaves are not cleary distichous but the stems and branches are more or less flattened when viewed laterally.

Neckera chlorocaulis C. M. Syn. Musc. Frond. **2**: 663. 1851.

Vicinity of Fraijanes, no. 47453a.

DISTRIBUTION: Mexico.

Not previously known outside of Mexico.

Neckera wercklei Broth. & Thér. Soc. Havraise Étud. Div. **88**: 312. 1921.

Viento Fresco, no. 47878a; vicinity of Fraijanes, nos. 47453b, 47650; Cerro de las Vueltas, no. 43547.

DISTRIBUTION: Costa Rica.

This species is very close to *N. chilensis* Schimp., from Colombia and Ecuador, but may be distinct in the shorter capsules with more elongate, less incrassate exothecal cells and in the peristome teeth, obscurely or not at all cross-striate at the base.

Neckeropsis undulata (Palis.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 187. 1925.

Vicinity of Capulin, no. 40142a; vicinity of Pejivalle, no. 47153b.

DISTRIBUTION: Florida; West Indies; South America.

Homalia glabella (Swartz) Mitt. Journ. Linn. Soc. **12**: 458. 1869.

El Silencio, no. 44737; vicinity of Pejivalle, no. 47141a.

DISTRIBUTION: West Indies; Mexico.

This species has never been found in fruit, and the above specimens, like others, show only sterile plants and plants with unfertilized archegonial flowers.

Porotrichum plicatulum Mitt. Journ. Linn. Soc. **12**: 461. 1869.

Vicinity of Capulin, no. 40142.

DISTRIBUTION: Trinidad; South America.

The first record for this little-known species in Central America.

Porotrichum cobanense C. M. Bull. Herb. Boiss. **5**: 202. 1897.

El Muñeco, nos. 51190, 50953, 33709; Cerro de la Carpintera, no. 35631; Laguna de la Chonta, no. 42164; Los Ayotes, no. 45374; Santa Maria de Dota, no. 34290; vicinity of Fraijanes, nos. 47601b, 47588; La Palma, no. 38179; Cerro de Piedra Blanca, nos. 32526, 32527, 32529; Laguna de la Escuadra, nos. 41999, 41938.

DISTRIBUTION: Guatemala; Panama.

Porotrichum longirostre (Hook.) Mitt. Journ. Linn. Soc. **12**: 461. 1869.

Cerro de las Caricias, nos. 52004, 52231a, 52022a; vicinity of Fraijanes, no. 47705a; La Palma, nos. 33070a, 32920a, 38168d, 38092; Cerros de Zurqui, no. 50363; Las Nubes, no. 38776; El Muñeco, no. 50889a; vicinity of Pejivalle, nos. 47124, 47174d, 46877a; Cerro de las Vueltas, no. 50627b; Yerba Buena, no. 49690a; Cerro de las Lajas, no. 51509.

DISTRIBUTION: Colombia; Ecuador; Bolivia; Brazil.

P. plagiorhynchium Ren. & Card. is distinguished, by the authors, from true *P. longirostre* by the stem and branch leaves less slenderly and more broadly acuminate, and by the oblique beak of the operculum. The type of the former species, and several of the above numbers which are in good fruiting condition, compare almost identically with *Weir* no. 250 from Colombia, so far as the sporophyte is concerned, and as there is considerable variation in the shape of the leaves, I am strongly tempted to believe that they all belong to the one specific type. Among the collections listed above is a series comprising nos. 47124, 47174d, 46877a, 32920a, 50627b, 52231a, 49690a, 51509, which have very narrow, acute branch leaves and numerous flagellate branches clothed with minute leaves. These plants are very similar in vegetative characters to *P. insularum* Mitt., but as the Costa Rican series is consistently sterile its actual status is uncertain.

Porothamnium crassipes (Ren. & Card.) Fleisch.

Volcan de Turrialba, nos. 35044, 35116, 35129.

DISTRIBUTION: Costa Rica.

The lower squamiform stem leaves in these plants are obtuse and apiculate, either with or without an ill-defined costa. This species may be distinct from *P. neckeraeforme* (Hampe) Fleisch. from Costa Rica, Colombia, and Bolivia, but no material of the latter species is available for comparison.

Lembophyllaceae

Porotrichodendron superbum (Tayl.) Broth.

Cerro de las Vueltas, nos. 43593a, 43696a; Laguna de la Chonta, no. 42262a.

DISTRIBUTION: Venezuela; Colombia, Ecuador; Bolivia.

Rigodium gracile Ren. & Card. Bull. Soc. Bot. Belg. **32**[1]: 197. 1893.

Vicinity of Fraijanes, no. 47653c.

DISTRIBUTION: Costa Rica.

Pilotrichaceae

KEY TO COSTA RICAN SPECIES OF PILOTRICHUM

Ultimate branch leaves spirally imbricated in 3 rows.....**P. ramosissimum.**
Ultimate branch leaves not ranked.
Leaf cells minute, 6 μ long.....**P. pallidum.**
Leaf cells larger, 10 μ long or more.
Branch leaves obtuse and mucronate.....**P. mucronatum.**
Branch leaves broadly acute.....**P. compositum.**

Pilotrichum ramosissimum Mitt. Journ. Linn. Soc. **12**: 388. 1869.

Vicinity of Pejivalle, no. 46877; El Muñeco, no. 50889.

DISTRIBUTION: Panama; Colombia.

Pilotrichum pallidum Bartr., sp. nov. FIG. 30, A–F.

Dioicous? Secondary stems conspicuously reddish under the pale, dull green leaves, bipinnate or tripinnate, 4 to 6 cm. long, the ultimate branches slender and catenulate by the rather distant, incurved leaves; stem leaves 1.2 mm. long,

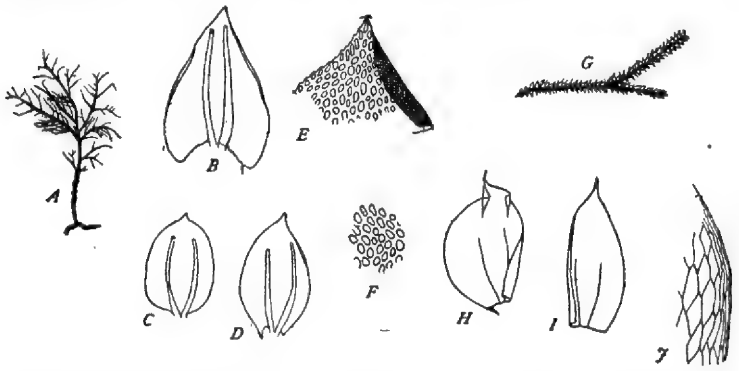

FIG. 30.—*Pilotrichum pallidum* Bartr. *A*, stem, one-half natural size; *B*, stem leaf, × 16; *C* and *D*, two branch leaves, × 16; *E*, apex of stem leaf, × 240; *F*, median cells, × 240. *Cyclodictyon brittonae* Bartr. *G*, part of stem, one-half natural size; *H*, lateral stem leaf, × 8; *I*, median stem leaf, × 8; *J*, upper leaf cells and margin, × 240

broadly ovate, bluntly acute, concave, closely appressed to the stem below, slightly spreading with incurved points above; margin plane and entire below, minutely serrulate and reflexed above the middle; costae smooth on the back ending just below the apex; leaf cells very small, elliptic, up to 6 μ long, smooth or minutely papillose; branch leaves 0.75 mm. long, broadly ovate, obtuse, apiculate, rather loosely imbricated with incurved points; costae ending about four-fifths of the way up, dentate on the back; brood filaments absent; margin serrulate almost to the base, often narrowly reflexed above the middle; cells minute, obscure as in the stem leaves. Sporophyte unknown.

TYPE: On tree, El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, Paul C. Standley and Juvenal Valerio, January 18 and 19, 1926, no. 45247.

The minute obscure colorless areolation distinguishes this plant from any species with which it might be compared.

Pilotrichum mucronatum Mitt. Journ. Linn. Soc. **12**: 389. 1869.

La Colombiana Farm, no. 36886; Yerba Buena, no. 50047.

DISTRIBUTION: Jamaica; Costa Rica.

Pilotrichum compositum (Swartz) Palis. Prodr. 82. 1805.

Vicinity of Fraijanes, no. 46938; El Muñeco, no. 50905.

DISTRIBUTION: West Indies; Costa Rica; Venezuela.

Hookeriaceae

Daltonia aristifolia Bartr., sp. nov. FIG. 31.

Autoicous. Stem erect, up to 1.5 cm. high, simple; leaves erect and somewhat flexuous when dry, erect-spreading when moist, 3.5 mm. long, linear-lanceolate, subulate-acuminate, plicate; margin entire, plane below, incurved above the middle; costa slender, indistinct, disappearing about three-fourths of the way up; leaf cells elliptic-hexagonal, rather elongate, smooth, several rows toward the margin linear, forming a border which gradually widens toward the base; lower cells linear, several rows at the insertion lax and irregular, often colored brown; seta red, rough above; capsule erect, 1 mm. long; exothecal cells rounded, collenchymatous; peristome teeth reflexed when moist, linear-lanceolate, papillose, irregularly split along the median line; segments very narrow, yellowish, erect, densely papillose, as long as the teeth, from a low basal membrane barely projecting above the rim; calyptra and lid unknown; spores smooth, 12 μ in diameter.

TYPE: Southern slope of Volcan de Turrialba, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley, February 22, 1924, no. 35156a.

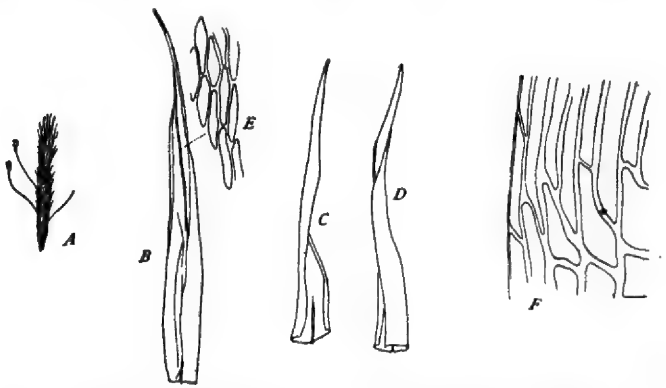

FIG. 31.—*Daltonia aristifolia* Bartr. *A*, plant, natural size; *B*, leaf, × 16; *C* and *D*, two leaf apices, × 40; *E*, upper leaf cells, × 240; *F*, basal angle of leaf, × 240

Distinct from *D. splachnoides* (Swartz) Hook. & Tayl. in the long-attenuate leaf points and the seta smooth below, and from both *D. longifolia* Tayl. and *D. stenophylla* Mitt. in the elongated upper leaf cells. According to description, *D. lorifolia* C. M. has the leaf margins plane throughout.

Adelothecium bogotense (Hampe) Mitt. Journ. Linn. Soc. **12**: 391. 1869.

Cerro de las Lajas, no. 51509d; La Estrella, no. 39466a; Viento Fresco, no. 47829a.

DISTRIBUTION: West Indies; Mexico; South America.

The illustration of this species in both editions of Engler and Prantl shows high, split-pointed papillae over the lumens of the leaf cells, and the generic description brings out the same feature. None of the above collections from Costa Rica and none of the specimens I have examined from other localities show this character, from which it may be inferred that there are either two distinct species or, as is more likely, the illustration in this respect is in error.

Hookeria acutifolia Hook. in Schwaegr. Suppl. **2**²: 36. *pl. 163*. 1826.

Cerros de Zurqui, no. 50399a.

DISTRIBUTION: West Indies; South America; Java; Ceylon.

KEY TO COSTA RICAN SPECIES OF CYCLODICTYON

Upper leaf cells isodiametric ..... **C. albicans.**
Upper leaf cells oval-hexagonal, longer than broad.
  Leaves abruptly apiculate from a rounded apex ..... **C. brittonae.**
  Leaves gradually narrowed to a flexuose hair-point ..... **C. rubrisetum.**

Cyclodictyon albicans (Swartz) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 935, 1909.

El Muñeco, nos. 51098, 51185b; La Estrella, no. 39233a; vicinity of San Jose, no. 47396; Cerro de las Caricias, no. 52013; vicinity of Pejivalle, nos. 47009. 46976a, 46951a, 47174c, 46988; La Tejona, no. 45775: Quebrada Serena, no. 46254.

DISTRIBUTION: West Indies; Mexico; South America.

There is more or less variation in the plants referred here. The upper leaf cells vary from 25 to 45 μ in diameter, the border toward the apex is of either one or two rows of cells, and the costae vary from smooth to remotely serrulate with short confluent, hyaline teeth; but the characters do not seem to be coordinated in any systematic way, and it seems impossible to segregate satisfactorily the plant described as *C. humectatum* Card. from Mexico. In nos. 45775, 46254, and 51098 the leaves are more sharply acute, the upper cells smaller, and the color brownish green.

Cyclodictyon brittonae Bartr., sp. nov. FIG. 30, G–J.

Dioicous? Pale green; stems prostrate, up to 6 cm. long, about 4 mm. wide with leaves, denuded in the older parts, sparingly branched, slightly radiculose here and there; leaves loosely imbricate, in about 6 rows, those of the dorsal and ventral rows ovate, short acuminate, those of the lateral rows broader and more abruptly contracted to a short flexuose grooved point; margin entire below, sinuate above the middle and denticulate toward the apex; leaf cells lax, elliptic-hexagonal, up to 100 μ long by 30 μ wide, gradually narrowed to an indistinct border of elongated cells about 2 or 3 rows wide. Sporophyte unknown.

TYPE: La Hondura, Province of San Jose, Costa Rica, altitude 1,300 to 1,700 meters, Paul C. Standley and Juvenal Valerio, March 9, 1926, no. 51882a.

The prostrate stems preclude the reference to any species of *Lepidopilum*, and the unusually large and lax areolation seems to give the plant a unique status in the genus in which it is placed.

Cyclodictyon rubrisetum (Mitt.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 936. 1909.

El Muñeco, nos. 33931, 33765.

DISTRIBUTION: Colombia.

Callicostella pallida (Hornsch.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76:** 353. 1877.

La Hondura, no 36291a; La Colombiana Farm, no. 36866a; Hamburg Finca, no. 48807a; El Muñeco, no. 51185a; Finca Montecristo, nos. 48523, 48618; vicinity of Orosi, no. 39680a; vicinity of Guapiles, no. 37215.

DISTRIBUTION: West Indies; Central America; South America.

Callicostella oerstediana (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76:** 354. 1877.

Quebrada Serena, no. 46254b.

DISTRIBUTION: Costa Rica.

KEY TO COSTA RICAN SPECIES OF HOOKERIOPSIS

Leaves obtuse.
  Leaf margins coarsely serrate with split teeth ..... **H. incurva.**
  Leaf margins sinuate ..... **H. obtusifolia.**

Leaves acute or acuminate.
Leaves not transversely undulate.
Leaf cells spiculose-papillose ..... **H. subfalcata.**
Leaf cells not spiculose-papillose.
Seta 1 cm. long or less; plants slender ..... **H. variabilis.**
Seta 2 to 3 cm. long; plants more robust ..... **H. falcata.**
Leaves transversely undulate.
Leaves abruptly acute ..... **H. laevinervis.**
Leaves acuminate.
Leaf cells smooth ..... **H. crispa.**
Leaf cells papillose ..... **H. standleyi.**

Hookeriopsis incurva (Hook. & Grev.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 942. 1909.

Vicinity of Pejivalle, nos. 47147, 47178; vicinity of Guapiles, no. 37487.

DISTRIBUTION: West Indies; Guatemala; South America.

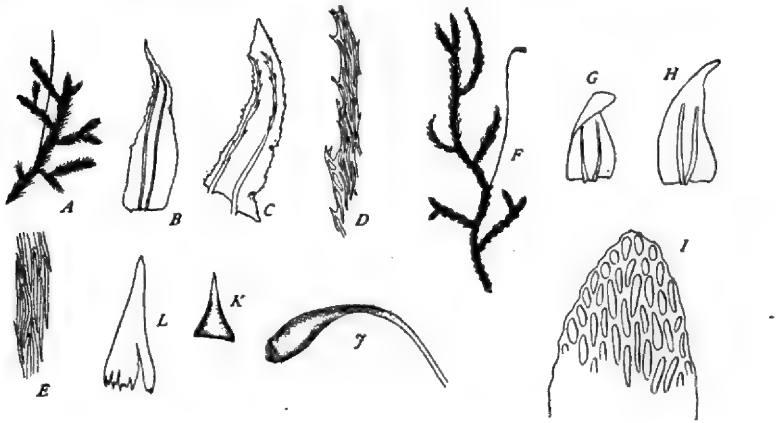

FIG. 32.—*Hookeriopsis standleyi* Bartr. *A*, plant, natural size; *B*, stem leaf, × 16; *C*, apex of leaf, dorsal view, × 40; *D*, part of upper leaf margin, × 240; *E*, median leaf cells, × 240. *Hookeriopsis obtusifolia* Bartr. *F*, plant, natural size; *G* and *H*, two leaves, × 16; *I*, apex of leaf, × 240; *J*, capsule, × 6; *K*, lid, × 8; *L*, calyptra, × 8

Hookeriopsis obtusifolia Bartr., sp. nov. FIG. 32, F–L.

Dioicous? No antheridial flowers found. Stems prostrate, about 3 cm. long, irregularly branched, slender, deep green; leaves falcate-secund, about 1.25 mm. long, lightly plicate, oblong-ovate, rounded at the apex; margin plane, entire below, sinuate toward the apex; costae ending about two-thirds of the way up, smooth on the back; leaf cells linear-flexuose with rounded ends, smooth, rather broader toward the base but hardly differentiated; inner perichaetial leaves ovate-lanceolate, acuminate, 1.5 mm. long, the outer much smaller, broadly ovate, apiculate; seta up to 22 mm. long, red, smooth below, slightly roughened above; capsule horizontal, becoming pendent with age, ovoid-cylindric, pale brown, 1.5 mm. long; lid rostrate from a convex base; calyptra smooth, irregularly laciniate at the base; peristome teeth cross-striate with an evident median furrow; basal membrane about one-half as long as the teeth, papillose; segments broad, keeled, about 10 apertures along the median line, pale yellow, papillose.

TYPE: On wet rocks, Cerro de las Caricias, north of San Isidro, Province of Heredia, Costa Rica, Paul C. Standley and Juvenal Valerio, March 11, 1926, no. 52068.

The falcate-secund obtuse leaves clearly distinguish this plant from any of its congeners, and I know of no species with which it might be compared.

Hookeriopsis subfalcata (Hampe) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 362. 1877.

Laguna de la Escuadra, no. 41971.

DISTRIBUTION: Colombia.

Hookeriopsis variabilis (Hornsch.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 362. 1877.

El Muñeco, nos. 51185, 51098b; Quebrada Serena, no. 46254b.

DISTRIBUTION: Colombia; Bolivia; Brazil.

Hookeriopsis falcata (Hook.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 363 1877.

Cerros de Zurqui, nos. 50570, 50399, 50618; Yerba Buena, no. 50002; Cerro. de las Caricias, no. 51984; Cerro de las Lajas, no. 51476a; La Palma, nos. 38069a, 33070.

DISTRIBUTION: Guadeloupe; South America.

Hookeriopsis crispa (C. M.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 358. 1877.

Vicinity of Orosi, nos. 39880, 39831a, 39882; Cerro de las Caricias, no. 52098; Yerba Buena, no. 49779; Cerro de las Lajas, no. 51511; Cerros de Zurqui, nos. 50320, 50353; Cerro de la Carpintera, no. 33563; El Muñeco, nos. 33672, 33668, 51217, 51342.

DISTRIBUTION: Costa Rica; South America.

Hookeriopsis standleyi Bartr., sp. nov. FIG. 32, A–E.

Dioicous? Pale green; stems prostrate, 1.5 to 2 cm. long, more or less radiculose, irregularly branched; leaves uniform, erect-spreading, somewhat complanate, oblong-ovate, gradually acuminate, transversely undulate in the upper half, bluntly pointed; margin plane and entire below, undulate and irregularly recurved in the upper half, dentate above middle with simple or bifid teeth, especially toward the apex; costae dentate on the back above, disappearing just below the apex; leaf cells narrowly linear, papillose on the back by projecting ends; seta red, smooth as far as observed; capsule unknown.

TYPE: On tree, vicinity of Pejivalle, Province of Cartago, Costa Rica, altitude about 900 meters, Paul C. Standley and Juvenal Valerio, February 7 and 8, 1926, no. 47155.

The combination of papillose leaf cells and bifid marginal teeth suggests a relationship with *H. rugulosa* (Mitt.) Jaeg., from Ecuador, but this species has obtuse leaves.

Lepidopilidium subdivaricatum (Ren. & Card.) Broth. in. Engl. & Prantl, Pflanzenfam. 1^3: 944. 1909.

Santa Maria de Dota, no. 42431b.

DISTRIBUTION: Costa Rica.

Lepidopilum subenerve Brid. Bryol. Univ. **2**: 268. 1827.

Vicinity of Pejivalle, no. 47174c; El Muñeco, no. 33611f; vicinity of Capulin, no. 40142b.

DISTRIBUTION: West Indies; South America.

Lepidopilum haplociliatum (C. M.) Par. Ind. Bryol. Suppl. 223. 1900.

La Colombiana Farm, no. 36569a.

DISTRIBUTION: Guatemala.

Lepidopilum polytrichoides (Hedw.) Brid. Bryol. Univ. **2**: 269. 1827.

El Arenal, no. 45257; El Silencio, nos. 44691, 44698; vicinity of Pejivalle, no. 47091; vicinity of Guapiles, no. 37102.

DISTRIBUTION: Mexico; Costa Rica; South America; West Indies.

Lepidopilum platyphyllum Ren. & Card. Bull. Soc. Bot. Belg. 32^1: 192. 1893.

Vicinity of Guapiles, no. 37339.

DISTRIBUTION: Costa Rica.

Lepidopilum carneum Bartr., sp. nov. FIG. 33.

Evidently dioicous, no antheridial flowers found; secondary stems up to 5 cm. high, sparingly branched, about 6 mm. wide with leaves when moist, rather blunt at the ends; lateral leaves fleshy, contorted when dry, about 4 mm. long, oblong-lingulate, obtuse, apiculate; margin plane, entire below, denticulate toward the apex; costae slender, ending a little above the middle; median leaves similar but broadly ovate in outline; upper and median leaf cells hexagonal-rhomboidal, about 90 μ long by 35 μ wide, becoming rectangular toward the base and gradually elongated toward the margins, blending with the border which is about 2 cells wide near the apex and indistinctly wider below, pellucid, thin-walled, in cross section nearly square or deeper than wide. Sporophyte unknown.

TYPE: On tree, La Estrella, Province of Cartago, Costa Rica, Paul C. Standley, March 26 and 27, 1924, no. 39202.

This species seems to be near *L. tortifolium* Mitt., but it is distinct from any species with which it might be compared in the lax pellucid leaf cells and the thick fleshy leaves.

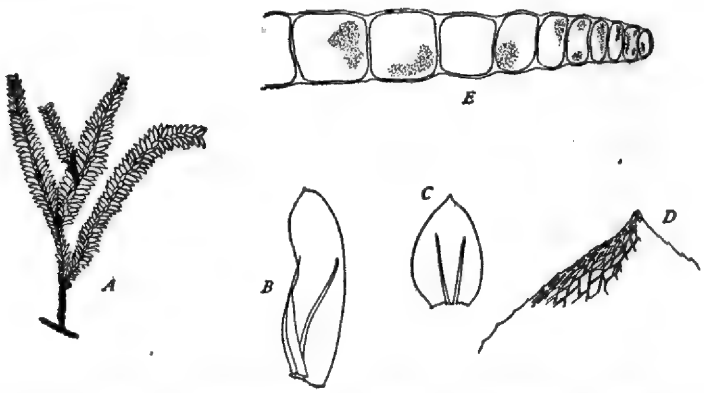

FIG. 33.—*Lepidopilum carneum* Bartr. *A*, moist plant, three-fourths natural size; *B*, lateral leaf, × 6; *C*, median leaf, × 6; *D*, apex of leaf, × 40; *E*, part of cross section from upper part of lamina, × 240

Isodrepanium lentulum (Wils.) E. G. Britton, Torreya **14**: 28. 1914.

Cerro de las Caricias, no. 52162; Yerba Buena, no. 50083; Cerro de las Lajas, no. 51509a; Cerros de Zurqui, no. 50627a.

DISTRIBUTION: West Indies; Central America; South America.

Thamniopsis pendula (Hook.) Fleisch. Laubmfl. Java **3**: 952. 1908.

La Hondura, no. 37860; La Estrella, no. 39201; Cerro de las Caricias, nos. 52089, 52014, 52010, 51692, 51997, 52071.

DISTRIBUTION: Ecuador; Peru.

The occurrence of this species in Costa Rica is a rather noteworthy extension of range northward, it having been known previously only from Ecuador and Peru. There is a certain amount of variation in the leaves, as remarked by Mitten in his note on this species, but the perichaetial leaves are only slightly serrulate and the plants are fully as robust as in the type, both of which characters seem clearly to distinguish the Costa Rican collections from *Hookeriopsis killipii* R. S. Williams, which, if *Thamniopsis* be maintained as a genus, should be designated as **Thamniopsis killipii** (R. S. Williams) Bartr.

NEOHYPNELLA Bartr., gen. nov.

Differs from *Hypnella*, to which it is closely allied, by the rounded, or only slightly flattened stems, the deeply concave, mucronate leaves, and especially in the peristome teeth with a zig-zag median line.

Type species, *Neohypnella mucronifolia* Bartr.

Neohypnella mucronifolia Bartr., sp. nov. FIG. 34.

Dioicous? Stems creeping, up to 8 or 10 cm. long, irregularly bipinnate; branches short, pale green or golden brown; stem leaves 1.5 mm. long, oblong-ovate, erect-spreading, concave, closely imbricated, mucronate, the point short and oblique or recurved; leaf cells linear, acute, papillose on both sides with 3 to 5 spiculose papillae often split at the point, at the extreme base smooth and more lax; margin plane, minutely serrulate with projecting papillae; perichaetium about 2.5 mm. high, the inner leaves abruptly contracted from an ovate clasping base to a flat flexuous linear-lanceolate point serrulate toward the apex, the outer more gradually narrowed to a broad flat flexuous acumen, the outermost much

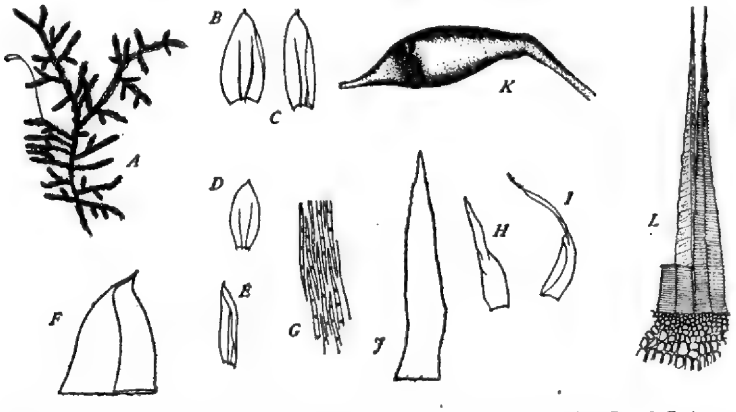

FIG. 34.—*Neohypnella mucronifolia* Bartr. *A*, plant, one-half natural size; *B* and *C*, stem leaves, × 8; *D* and *E*, branch leaves, × 8; *F*, apex of stem leaf, × 40; *G*, upper leaf cells, × 240; *H*, outer perichaetial leaf, × 8; *I*, inner perichaetial leaf, × 8; *J*, apex of inner perichaetial leaf, × 42; *K*, dry capsule, × 5.5; *L*, part of peristome, × 42

smaller, ovate, acute, all ecostate, with very long narrow cells, smooth throughout or minutely papillose at the extreme apex; seta red, smooth below, rough above, 16 to 18 mm. long; capsule inclined, ovoid-cylindrical, about 3 mm. long, gradually narrowed to a swollen neck; peristome teeth linear-lanceolate; articulations numerous, closely spaced, projecting on the edges, cross-striate, papillose at the extreme apex, with a slender zig-zag median line; segments of inner peristome narrow, papillose, carinate; annulus none; lid conic, rostrate, a scant 2 mm. long; calyptra lobed at the base, extending a little below the rim; spores up to 20 μ in diameter, rough.

TYPE: On tree, La Palma, Province of San Jose, Costa Rica, altitude about 1,600 meters, Paul C. Standley, February 3, 1924, no. 33077. Also from La Hondura, nos. 36205, 51866; Cerro de las Caricias, nos. 52143b, 52145a, 52167; La Colombiana Farm, no. 36570.

Neohypnella chrysophyllopodia (C. M.) Bartr. (*Hypnella chrysophyllopodia* [C. M.] Broth.), from Trinidad, known only in sterile condition, is a very similar plant, but the leaves are described as "*e basi angusta equali in laminam breviusculum angustam lineari-oblongam*", which would seem clearly to distinguish this species from the Costa Rican type. Dr. Brotherus has advised me that

Hypnella pilotrichelloides (Broth.) Broth., from Guiana, is a synonym of *H. chrysophyllopodia*, so that the genus *Neohypnella*, as known at present, comprises only the two species, from Trinidad and Costa Rica, respectively.

Hypnella pilifera (Hook. & Wils.) Jaeg. Ber. St. Gall. Nat. Ges. **1875–76**: 366. 1877.

Cerro de la Carpintera, no. 33564; Yerba Buena, nos. 49925a, 49713, 49925, 49834.

DISTRIBUTION: Colombia; Brazil; Ecuador.

Rhynchostegiopsis flexuosa (Sull.) C. M. Nuov. Giorn. Bot. Ital. **4**: 163. 1897.

El Muñeco, nos. 33697, 51185c.

DISTRIBUTION: Cuba.

This seems to be the first record for this species outside of Cuba. The Costa Rican plants are similar in every way to those from Cuba.

Rhynchostegiopsis auricolor (C. M.) Broth. in Engl. & Prantl, Pflanzenfam. **1**[3]: 1235. 1909.

Quebradillas, no. 42934b; Viento Fresco, nos. 47824, 47877; vicinity of Fraijanes, nos. 47592, 47653.

DISTRIBUTION: Guatemala.

Harpophyllum aureum (Palis.) Spruce, Cat. 1867.

La Palma, nos. 37987, 38168, 38141; La Hondura, nos. 37885, 36547.

DISTRIBUTION: Guatemala; Costa Rica; South America; West Indies.

Leucomiaceae

Leucomium lignicola Spruce, Journ. Linn. Soc. **12**: 503. 1869.

Vicinity of Guapiles, no. 37071; La Colombiana Farm, no. 36866; El Muñeco, no. 51080a.

DISTRIBUTION: Brazil; Peru.

Nos. 37071 and 36866 show the calyptrae sparsely pilose and the leaves filiform-acuminate. No. 51080 is sterile but is essentially the same in vegetative characters, and is therefore referred here instead of to *L. costaricense* Ren. & Card., which the authors distinguish from the above species by the smooth calyptra and longer-cuspidate leaf points.

Hypoterygiaceae

Hypopterygium tamarisci (Swartz) Brid. Bryol. Univ. **2**: 715. 1827.

Laguna de la Escuadra, no. 41952; El Silencio, no. 44578; Viento Fresco, no. 47788b; Las Nubes, no. 38581; La Hondura, no. 37795.

DISTRIBUTION: Central America; South America; West Indies.

Thuidaceae

Rauia subcatenulata (Sch.) Broth. in Engl. & Prantl, Pflanzenfam. **1**[3]: 1005. 1909.

Cerros de Candelaria, *Manuel Valerio* 45.

This collection seems to be identical with typical specimens from Mexico, and it is altogether probable that *Rauia leskeaefolia* (Ren. & Card.) Broth. should be treated as a synonym of this species.

Thuidium wrightii Jaeg. Ber. St. Gall. Nat. Ges. **1876–77**: 249. 1878.

El Muñeco, no. 33461.

DISTRIBUTION: Cuba; Jamaica.

Thuidium pellucens Ren. & Card. Bull. Soc. Bot. Belg. **32**[1]: 198. 1893.

Santa Maria de Dota, nos. 42394, 43118; El Muñeco, nos. 51053, 33930; Cerro de Piedra Blança, no. 32516.

DISTRIBUTION: Costa Rica.

Thuidium miradoricum Jaeg. Ber. St. Gall. Nat. Ges. **1876–77**: 263. 1878.

Santa Maria de Dota, nos. 43249, 41742a, 43348, 41860a, 43366; Laguna de la Escuadra, nos. 42004, 42026, 41925; vicinity of Fraijanes, nos. 47463, 47502; Viento Fresco, no. 47956; El Muñeco, 51082; La Tejona, no. 45865; Yerba Buena, nos. 49977, 50083, 50118; Finca la Cima, no. 42808; El Arenal, nos. 45167, 44654; Quebradillas, no. 43000; Las Nubes, no. 38812; Volcan de Turrialba, no. 35277a; Zurqui, no. 48286a.

DISTRIBUTION: Mexico; Costa Rica; Haiti.

Thuidium miradoricum Jaeg. var. **gracilescens** Bartr., var. nov.

This form may be distinguished at sight from the species by the slender elongated stems, 15 cm. or more long, remotely bipinnate, the ultimate branches almost filiform. The stem leaves are ovate and more slenderly acuminate than in the species, and the branch leaves proportionately narrower, with the papillae of the leaf cells often furcate. Without fruit, any more critical definition would seem useless, as the plants in this group are generally sterile in tropical regions, and the determinations are, at best, often unsatisfactory.

Thuidium antillarum Besch. Fl. Bry. Antill. Fr. 70. 1876.

Vicinity of Pejivalle, no. 47146; Volcan de Turrialba, no. 35233; El Muñeco, nos. 33767, 33449; La Hondura, nos. 37670, 36495; vicinity of Orosi, no. 39616; La Colombiana Farm, no. 36569.

DISTRIBUTION: Costa Rica; West Indies.

Thuidium delicatulum (Dill., L.) Mitt. Journ. Linn. Soc. **12**: 578. 1869.

Near Finca la Cima, no. 42810; El Muñeco, no. 33470b; Zurqui, no. 48081a; Laguna de la Escuadra, no. 41922; Santa Maria de Dota, no. 41642; Cerro de las Vueltas, nos. 43742, 43534.

DISTRIBUTION: North America; South America; West Indies; Europe; Asia.

This seems to be the first time the species has been recorded from Central America.

Amblystegiaceae

Platyhypnidium aquaticum (Hampe) Fleisch. Laubmfl. Java **4**: 1537. 1922.

Cerro de las Vueltas, nos. 43772, 43781a.

DISTRIBUTION: South America.

Not previously known from Central America.

Brachytheciaceae

Pleuropus bonplandii (Hook.) Broth. in Engl. & Prantl, Pflanzenfam. **1**[3]: 1138. 1909.

Las Nubes, no. 38520; vicinity of Fraijanes, no. 47529; Volcan de Turrialba, no. 35035; Quebradillas, no. 42934a.

DISTRIBUTION: Mexico; Costa Rica; South America; West Indies.

Brachythecium costaricense Ren. & Card. Bull. Soc. Bot. Belg. **41**[1]: 123. 1902–03.

El Muñeco, nos. 33484, 33611c; Santa Maria de Dota, no. 42394a.; Las Nubes, no. 38449.

DISTRIBUTION: Costa Rica.

Rhynchostegium scariosum (Tayl.) Jaeg. Ber. St. Gall. Nat. Ges. **1876–77**: 374. 1878.

Between San Pedro de Montes de Oca and Curridabat, no. 41297.

DISTRIBUTION: Panama; South America.

Eurhynchium exasperatum (Hampe) Jaeg. Ber. St. Gall. Nat. Ges. **1876–77**: 361. 1878. FIG. 35.

Cerro de las Vueltas, nos. 43781, 43774.

DISTRIBUTION: Mexico; South America.

This species is not included in either *Eurhynchium* or *Oxyrrhynchium* by Brotherus, and I thought it an undescribed species until a bit of the specimen from the Mitten Herbarium (*Weir* 355), sent through the kindness of Mrs. Britton, showed the Costa Rican plants to be indistinguishable from the South American type. The species is credited to Mexico in the Paris Index.

Entodontaceae

Erythrodontium longisetum (Hook.) Par. Ind. Bryol. 436. 1894–98.

Camino de Hatillo, nos. 32173, 32184; between San Pedro de Montes de Oca and Curridabat, no. 32771; along Rio Reventado, nos. 49432, 49570; vicinity of San Jose, nos. 38974, 41234, 33266; vicinity of Zapote, nos. 40274a, 40272; Cerro de Piedra Blanca, no. 32495; vicinity of San Sebastian, no. 49370.

DISTRIBUTION: Mexico; Central America; South America.

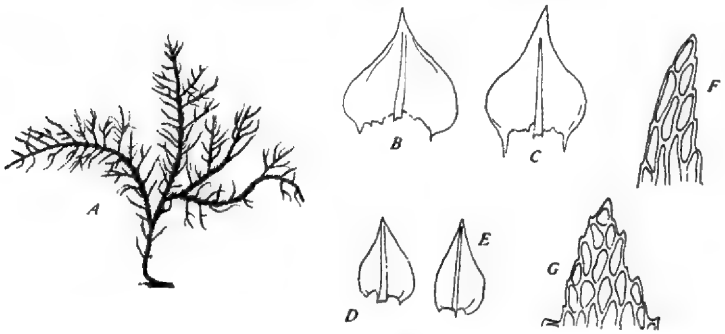

FIG. 35.—*Eurhynchium exasperatum* (Hampe) Jaeg. *A*, plant, one-half natural size; *B*, lower stem leaf, × 16; *C*, upper stem leaf, × 16; *D* and *E*, two branch leaves, × 16; *F*, apex of stem leaf, × 240; *G*, apex of branch leaf, × 240

Erythrodontium densum (Hook.) Par. Ind. Bryol. 436. 1894–98.

Santa Maria de Dota, no. 34172; Quebradillas, no. 43022.

DISTRIBUTION: Mexico; South America.

Entodon bernoullii C. M. Bull. Herb. Boiss. **5**: 209. 1897.

Along Rio Reventado, no. 49573.

DISTRIBUTION: Guatemala.

Entodon aurescens Hampe, Ann. Sci. Nat. V. Bot. **4**: 369. 1865.

Vicinity of Fraijanes, no. 47525a.

DISTRIBUTION: Mexico; South America.

Entodon jamesoni (Tayl.) Mitt. Journ. Linn. Soc. **12**: 528. 1869.

Santa Maria de Dota, no. 43175; vicinity of Fraijanes, no. 47495; Volcan de Turrialba, no. 34978; Cerro de Piedra Blanca, no. 32505; Quebradillas, nos. 43019, 43075.

DISTRIBUTION: Mexico; Costa Rica; South America.

Pleurozium schreberi (Willd.) Mitt. Journ. Linn. Soc. **12**: 537. 1869.

Cerro de las Vueltas, no. 43869; Laguna de la Chonta, no. 42331a.

DISTRIBUTION: North America; South America; Asia.

The occurrence of this familiar species in Costa Rica helps to fill in the gap between the known distribution in North America and South America.

Plagiotheciaceae

Pilosium longisetulum C. M. Flora **83**: 340. 1897.

Finca Montecristo, nos. 48581, 48494, 48513, 48544; vicinity of Pejivalle, no. 47178a.

DISTRIBUTION: Guatemala.

Sematophyllaceae

Meiotheciopsis lageniformis (C. M.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 1106. 1908.

La Palma, no. 32938.

DISTRIBUTION: Brazil.

There were only a few good capsules in this collection, but the unstriated peristome teeth and the short basal membrane of the inn r peristome are sufficient to locate definitely this interesting species, which has heretofore been known only from Brazil.

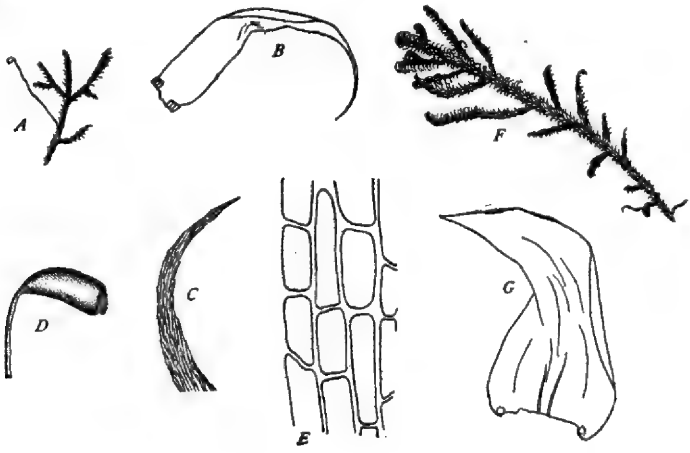

FIG. 36.—*Brotherella minutula* Bartr. *A*, plant, natural size; *B*, stem leaf, × 35; *C*, apex of leaf, × 240; *D*, moist capsule, × 8; *E*, exothecal cells, × 240. *Hypnum polypterum* (Mitt.) Broth. var. *robustum* Bartr. *F*, plant, one-half natural size; *G*, stem leaf, × 16

Brotherella minutula Bartr. sp. nov. FIG. 36, A–E.

Dioicous? Stems slender, prostrate, irregularly branched, 1 to 2 cm. long, in flat, pale green tufts; leaves falcate-secund, 1 mm. long, gradually long-acuminate from an oblong base; margin entire below, denticulate toward the apex; costa none; leaf cells elongate, in the basal angles 3 or 4 inflated, yellowish, pellucid cells; seta 15 mm. long, slender, red, flexuose; capsule small, nodding, about 1 mm. long; exothecal cells rectangular, not collenchymatous.

TYPE: Vicinity of Santa Maria de Dota, Province of San Jose, Costa Rica, altitude 1,500 to 1,800 meters, Paul C. Standley, December 14 to 26, 1925, no. 41766a.

Altogether a more slender, delicate plant than either *B. recurvans* or *B. delicatula* of North America.

Rhapidorrhynchium subsimplex (Hedw.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 427. 1925.

Finca Montecristo, nos. 48519, 48517; vicinity of Orosi, no. 39649

DISTRIBUTION: Mexico; South America; West Indies.

Rhapidorrhynchium subscabrum (C. M.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 427. 1925.

Quebradillas, no. 43022; Santa Maria de Dota, no. 41758; Viento Fresco, no 48010; Cerro de la Carpintera, no. 35562.

DISTRIBUTION: Costa Rica; South America.

Rhapidorrhynchium lindigii (Hampe) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 428. 1925.

Cerro de las Vueltas, no. 43748.

DISTRIBUTION: Costa Rica; Colombia.

Rhapidorrhynchium obliquerostratum (Mitt.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 428. 1925.

El Muñeco, nos. 51013a, 51207, 33670; Cerro de las Vueltas, no. 43584; along Rio Reventado, no. 49513; vicinity of Fraijanes, no. 47570; vicinity of Orosi, no. 39680; Laguna de la Chonta, nos. 42218, 42252, 42300; Quebradillas, no. 43022a; Santa Maria de Dota, nos. 41628a, 41651a, 43329, 43132, 41766, 43276, 41650.

DISTRIBUTION: Mexico; South America.

Sematophyllum caespitosum (Swartz) Mitt. Journ. Linn. Soc. **12**: 479. 1869.

El Muñeco, no. 33483; La Hondura, no. 37596; between Aserri and Tarbaca, no. 41365; La Tejona, no. 45929; Viento Fresco, no. 47954.

DISTRIBUTION: Florida; Mexico; Central America; South America; West Indies; Africa.

Sematophyllum kegelianum (C. M.) Mitt. Journ. Linn. Soc. **12**: 486. 1869.

Vicinity of Guapiles, no. 37516a.

DISTRIBUTION: West Indies; South America.

Acroporium pungens (Swartz) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 436. 1925.

Yerba Buena, nos. 49049, 50119; vicinity of Pejivalle, no. 47171; vicinity of Guapiles, nos. 37212, 37516; La Hondura, nos. 37672, 37628; Cerros de Zurqui, no. 50443; Cerro de la Caricias, nos. 52151, 52167a, 52278, 52229; La Palma, nos. 38069, 32920, 38227; vicinity of Orosi, no. 39818.

DISTRIBUTION: West Indies; Central America; South America.

Glossadelphus truncatulus (C. M.) Fleisch. Laubmfl. Java **4**: 1352. 1920.

Vicinity of Pejivalle, nos. 47141, 47174b.

DISTRIBUTION: Peru.

This seems to be the first time this interesting little species has been found since the original collection in Peru. Together with the following it forms a clearly defined group, characterized by the obtuse lingulate leaves and the papillose leaf cells.

Glossadelphus longisetus Bartr., sp. nov. FIG. 37.

Autoicous; male flowers gemmiform, intermingled with the female flowers; antheridial bracts ovate, acuminate, ecostate; margin serrulate above the middle, the lower cells lax, the upper cells linear, flexuose, with rather firm, pellucid walls. Stems creeping, irregularly and subpinnately branched; branches short and flattened, in rather thin, glossy mats; leaves oblong-ovate, rounded at the apex, concave, a scant 1 mm. long; margin sinuate to denticulate in the lower half, coarsely and irregularly dentate toward the apex with simple or divided teeth; costa short and double or none; cells elongate, smooth or indistinctly papillose with low blunt papillae by the projecting ends, shorter at the extreme base and on the margin at the apex; perichaetial leaves about 1.5 mm. long, abruptly linear-lanceolate from an oblong base, sharply dentate toward the apex; seta about 3 cm. long, red, smooth or a little rough above; capsule inclined or horizontal, ovoid, 2 mm. long without the lid; lid conic, 1 mm. high; peristome teeth lanceolate, cross-striate below, hyaline toward the point; basal

membrane about one-third the height of the teeth; segments rather broad, keeled, split along the median line; spores about 10 μ in diameter, smooth.

TYPE: On tree, vicinity of Guapiles, Province of Limon, Costa Rica, altitude 300 to 500 meters, Paul C. Standley, March 12 and 13, 1924, no. 37280. Also from vicinity of Guapiles, no. 37058.

This species is very distinct from *G. truncatulus* in the coarsely dentate leaf apex with divided teeth, and in the cells only lightly papillose by the projecting ends. It is obviously close to *G. lingulatus* Card., from Formosa, but that species, according to a specimen kindly supplied by M. Dismier, has the stems and branches broader and more strongly flattened, and larger leaves with the upper cells sharply spiculose-papillose at the ends with erect papillae up to 6 μ high.

Hypnaceae

Hypnum polypterum (Mitt.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 454. 1925.

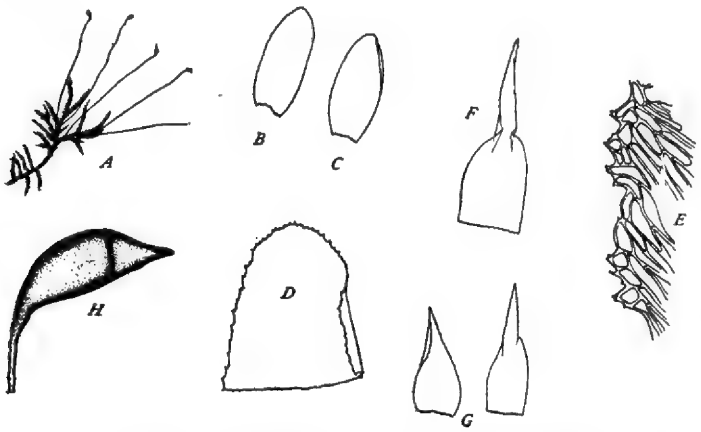

FIG. 37.—*Glossadelphus longisetus* Bartr. *A*, plant, one-half natural size; *B* and *C*, stem leaves, × 16; *D*, apex of stem leaf, × 40; *E*, part of leaf margin near apex, × 240; *F*, perichaetial leaf, × 16; *G*, two perigonal leaves, × 16; *H*, capsule, × 8

Quebradillas, nos. 43043, 43013; Cerro de las Caricias, no. 52143; Cerro de las Vueltas, no. 43544; Volcan de Turrialba, no. 35071; El Muñeco, no. 51162a; vicinity of Fraijanes, nos. 47497, 47525; vicinity of Orosi, no. 39817a; Santa Maria de Dota, no. 41636; Cerro de las Lajas, no. 51526; Cerros de Zurqui, nos. 50616, 50505a, 48163, 48195a, 50491, 50498, 48119; Yerba Buena, nos. 50066, 50111, 49041, 49972a, 49147, 49059, 49944.

DISTRIBUTION: Guadeloupe; Jamaica.

In all probability this is the plant listed as *Hypnum amabile* Hampe var. *brevifolium* Ren. & Card., no. 157 in Musci Costaricenses. It is apparently a very common and widely distributed plant in Costa Rica and, so far as I can see, is identical with specimens of *H. polypterum* from Jamaica. The alar cells are in a small but distinct cuplike group, and this, with the shorter-acuminate, more plicate leaves, are the characters which distinguish this species from *H. amabile*.

Hypnum polypterum (Mitt.) Broth. var. **robustum** Bartr., var. nov.

FIG. 36, F, G.

More robust and more irregularly branched than the species, with broader, more abruptly pointed leaves.

TYPE: On tree, southern slope of the Volcan de Turrialba, near the Finca del Volcan de Turrialba, Costa Rica, altitude 2,000 to 2,400 meters, Paul C. Standley, February 22, 1924, no. 35306.

Ectropothecium apiculatum (Hornsch.) Mitt. Journ. Linn. Soc. **12**: 512. 1869.

La Hondura, no. 37667; El Muñeco, nos. 51098b, 51185c; La Tejona, no. 45865a; vicinity of Pejivalle, nos. 46870, 46976, 46936, 47174, 46951.

DISTRIBUTION: Jamaica; Central America; South America.

Ectropothecium costaricense Ren. & Card. Bull. Soc. Bot. Belg. **41**[1]: 143. 1902–03.

Vicinity of Tilaran, nos. 44530, 44382; Santa Maria de Dota, no. 42375.

DISTRIBUTION: Costa Rica.

Isopterygium subtrichopelma Ren. & Card. Bull. Soc. Bot. Belg. **41**[1]: 142. 1902–03.

Viento Fresco, no. 47877a; vicinity of Guapiles, no. 37397.

DISTRIBUTION: Costa Rica.

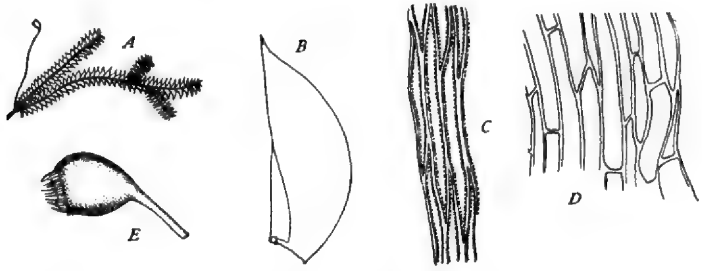

FIG. 38.—*Isopterygium integrifolium* Bartr. *A*, plant natural size; *B*, leaf, × 16; *C*, upper leaf cells and margin, × 240; *D*, basal angle of leaf, × 240; *E*, capsule, × 8

Isopterygium integrifolium Bartr., sp. nov. FIG. 38.

Autoicous. Stems about 3 cm. long, prostrate, irregularly branched, up to 3 mm. wide with leaves, in thin, flat, glossy, pale green tufts; leaves strongly complanate, oval-oblong, inequilateral, acute, hardly shrunken when dry, not decurrent; margin plane and entire; costa short and double; leaf cells elongate, narrowly linear, about 120 μ long by 8 μ wide, the ends acute; alar cells none; seta 10 to 12 mm. long, red; capsule, short-ovoid, 0.75 mm. long; lid and calyptra unknown.

TYPE: On tree, Cerro de las Vueltas, Province of San Jose, Costa Rica, altitude 2,700 to 3,000 meters, Paul C. Standley and Juvenal Valerio, December 29, 1925 to January 1, 1926, no. 43764. Also near Carmen Station, no. 48390.

This species has a superficial resemblance to *Taxiphyllum planissimum* (Mitt.) Broth., but may be readily distinguished by the entire, more sharply acute leaves and by the much more elongate areolation.

Isopterygium cylindricarpum Card. Rev. Bryol. **37**: 56. 1910. FIG. 39, A–E.

Near Finca la Cima, no. 42777a; Cerro de las Vueltas, no. 43761b; Volcan de Turrialba, nos. 35159, 35217, 35015, 35013.

DISTRIBUTION: Mexico.

Vesicularia amphibola (Spruce) Broth. in Engl. & Prantl, Pflanzenfam. **1**[3]: 1094. 1908.

La Hondura, no. 51882; vicinity of Pejivalle, no. 47118; Hamburg Finca, no. 48807; El Muñeco, no. 51068; El Silencio, no. 44638.

DISTRIBUTION: West Indies; South America.

Microthamnium elegantulum (Hook.) Mitt. Journ. Linn. Soc. **12**: 504. 1869.

Cerro de las Lajas, no. 51476; Cerro de la Carpintera, no. 35527; La Palma, no. 33070a; Cerro de las Vueltas, no. 43754.

DISTRIBUTION: Mexico; West Indies; South America.

Microthamnium thelistegum (C. M.) Mitt. Journ. Linn. Soc. **12**: 504. 1869.

Yerba Buena, nos. 49669, 49766; La Palma, no. 38168a; Viento Fresco, nos. 47841, 47788a; Zurqui, nos. 48279, 48081, 48286; vicinity of Fraijanes, no. 47420; vicinity of Orosi, no. 39790; Volcan de Turrialba, no. 35158; Quebradillas, no. 42844.

DISTRIBUTION: Florida; Mexico; South America; West Indies.

Microthamnium lehmannii Besch. Bull. Herb. Boiss. **2**[1]: 398. 1894.

La Palma, no. 38167; El Muñeco, nos. 51353, 33443; Las Nubes, no. 38545; vicinity of Orosi, no. 39877.

DISTRIBUTION: Costa Rica.

Microthamnium reptans (Swartz) Mitt. Journ. Linn. Soc. **12**: 506. 1869.

Laguna de la Escuadra, nos. 42003, 41970; Viento Fresco, nos. 47777, 47962; along Rio Reventado, nos. 49451, 49499, 49445; Zurqui, no. 48127; Cerro de las Vueltas, no. 43785; Santa Maria de Dota, nos. 43331, 41570, 44074; Quebradillas,

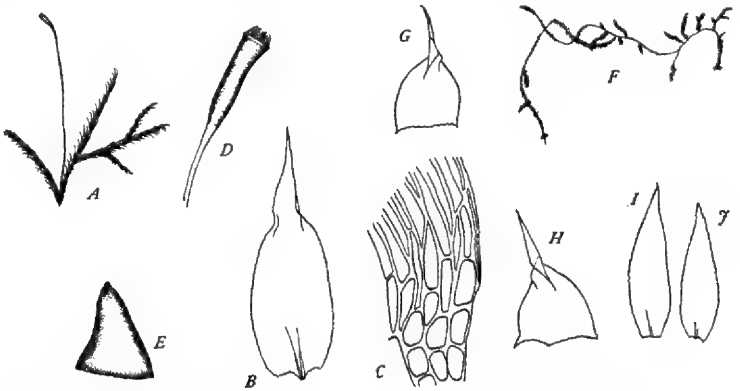

FIG. 39.—*Isopterygium cylindricarpum* Card. *A*, plant, natural size; *B*, stem leaf, × 16; *C*, basal angle of leaf, × 240; *D*, capsule, × 5.5; *E*, lid, × 16. *Microthamnium laxulum* Bartr. *F*, plant, one-half natural size; *G* and *H*, two lower stem leaves, × 16; *I* and *J*, two branch leaves, × 16

nos. 42931, 42934; Las Nubes, nos. 38449a, 38451; La Hondura, no. 37601; Cerro de Piedra Blanca, no. 32516a; Laguna de la Chonta, no. 42171; El Muñeco, nos. 51080, 51231, 51076; vicinity of Orosi, no. 39879; Yerba Buena, nos. 49707, 49691.

DISTRIBUTION: Costa Rica; South America; West Indies.

Microthamnium minusculifolium C. M. Bull. Herb. Boiss. **5**: 565. 1897.

Yerba Buena, no. 49925b; vicinity of Pejivalle, no. 46883; La Hondura, nos. 36616a, 36291; Viento Fresco, no. 47871; El Muñeco, no. 51098a; La Estrella, no. 39216; Cerro de las Caricias, nos. 51969, 52022; vicinity of Fraijanes, no. 47508.

DISTRIBUTION: Jamaica.

The plants in this series are slender, with wiry stems, and stem leaves about one-half as large as in *M. reptans*. They seem to be identical with specimens of this species from Jamaica.

Microthamnium langsdorffii (Hook.) Mitt. Journ. Linn. Soc. **12**: 507. 1869.

Volcan de Turrialba, nos. 35158a, 35144; Laguna de la Chonta, nos. 42249, 42157, 42262, 42202; vicinity of Fraijanes, nos. 47592a, 47584; Viento Fresco,

no. 47965a, vicinity of Pejivalle, nos. 47174a, 47007; near Finca la Cima, no. 42561; Cerro de las Vueltas, no. 43767; Zurqui, no. 48125; Quebradillas, no. 42926a; Cerro de Piedra Blanca, nos. 32517a, 32529a; El Muñeco, no. 33611; Laguna de la Escuadra, no. 41958; along Rio Reventado, no. 49474; La Estrella, nos. 39233, 39466; Finca las Concavas, nos. 41446, 41492; Santa Maria de Dota, nos. 41742, 43237; Cerro de las Caricias, no. 52231; La Palma, no. 38168b; Las Nubes, no. 38462; La Hondura, nos. 36195, 37879.

DISTRIBUTION: Costa Rica; South America.

Microthamnium laxulum Bartr, sp. nov. FIG. 39, F–J.

Dioicous? Stems erect at the base, arcuate, slender, irregularly branched; lower stem leaves broadly ovate, abruptly contracted to a rather short acumen which is strongly sulcate at the base; margin plane, entire below, denticulate above; branch leaves ovate-lanceolate, acute, denticulate more than halfway down. Sporophyte unknown.

TYPE: On tree, Naranjos Agrios, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, Paul C. Standley and Juvenal Valerio, January 29, 1926, no. 46539. Also La Tejona, no. 45865b.

It may appear of doubtful propriety to add another species to a group which already seems to defy satisfactory analysis, yet these plants apparently have a distinct character in the abruptly contracted, sulcate shoulders of the stem leaves, which is not shared by any other species.

Polytrichaceae

Catharinaea polycarpa C. M. Syn. Musc. Frond. 2: 558. 1851.

La Estrella, no. 39318.

DISTRIBUTION: Mexico; South America.

Catharinaea oerstediana C. M. Syn. Musc. Frond. 2: 558. 1851.

Laguna de la Escuadra, nos. 42002, 41977; Viento Fresco, no. 47983; El Muñeco, no. 51254; Cerro de la Carpintera, no 35757; Las Nubes, no. 38515; Santa Maria de Dota, no. 42509.

DISTRIBUTION: Costa Rica.

Catharinaea hirtella (Ren. & Card.) Broth. in Engl. & Prantl, Pflanzenfam. 1^3: 673. 1903.

Near Finca la Cima, no. 42622; Cerros de Zurqui, no. 50609.

DISTRIBUTION: Costa Rica.

As no calyptras of *C. oerstediana* are known and as the leaves are identical with those in the plants described as *C. hirtella*, it seems altogether probable that the latter is only a form of *C. oerstediana* with lighter-colored setae.

Pogonatum hamatifolium Ren. & Card. Bull. Soc. Bot. Belg. 31^1: 172. 1893.

Yerba Buena, nos. 49746, 49656; Las Nubes, nos. 38422, 38445.

DISTRIBUTION; Costa Rica.

A comparison of the Costa Rican material with *P. purpurescens* (Hampe) Mitt. from South America indicates rather conclusively that these plants all belong to one specific type.

Pogonatum robustum Mitt. Journ. Linn. Soc. 12: 616. 1869.

Laguna de la Chonta, no. 42227; near Finca la Cima, nos. 42749, 42818; Cerro de las Vueltas, nos. 43548, 43914; Santa Maria de Dota, no. 41660; Laguna de la Escuadra, no. 41953; Viento Fresco, no. 47933; Cerros de Zurqui, no. 50269.

DISTRIBUTION: Jamaica.

The lamellae in these plants vary from 2 to 5 cells in height, the costa is more or less strongly serrate on the back, and the margins are closely serrate with

sharp cartilaginous teeth down to the sheathing base or often below and extending halfway down to the insertion. There is no appreciable difference between these plants and *P. robustum* Mitt., from Jamaica, nor can I separate them from *P. robustum* Schimp. ex descr. The form with the lamellae reduced to 2 cells in height is *P. pittieri* Ren. & Card.

Pogonatum confertidens Broth. & Thér. Soc. Havraise Étud. Div. **88**: 310. 1921.

Region of La Esperanza, no. 35369.

DISTRIBUTION: Costa Rica.

Pogonatum liebmannianum Schimp. in C. M. Syn. Musc. Frond **2**: 563. 1851.

Between Aserri and Tarbaca, no. 41320.

DISTRIBUTION: Mexico.

Polytrichum antillarum Rich. in Brid. Bryol. Univ. **2**: 138, 747. 1827.

Cerro de las Vueltas, nos. 43552, 43894, 43840; Santa Maria de Dota, nos. 41596, 43429a; near Finca la Cima, nos. 42553, 42752; vicinity of Fraijanes, nos. 47422, 47476; Cerros de Zurqui, no. 50279; La Estrella nos. 39481, 39252; Volcan de Poas, no. 34843; Volcan de Turrialba, nos. 35266, 34938, 35332; Cerro de la Carpintera, no. 34233; Las Nubes, nos. 38405, 38440; La Palma, nos. 33194, 38203; between Aserri and Tarbaca, no. 41322; Zurqui, no. 48265; Yerba Buena, no. 50075.

DISTRIBUTION: West Indies; Central America; South America.

ADDITIONS AND CORRECTIONS

Holomitrium williamsi Bartr. The nearly flat, irregularly bistratose lamina cells and the presence of flagellate branches are characters which seem to ally this species more closely with *H. calycinum* (Swartz) Mitt., of Jamaica, than with any other species. The Costa Rican plant appears to be clearly distinct, however, in the shorter, more bluntly pointed leaves with the costa ending definitely below the apex.

Syrrhopodon lycopodioides (Swartz) C. M. Syn. Musc. Frond. **1**: 538. 1849.

Yerba Buena, no. 49766a.

Distribution: West Indies; northern South America.

A single plant, extracted from another collection, serves to establish definitely the occurrence of this characteristic West Indian species in Costa Rica.

Porotrichodendron substolonaceum (Besch.) Broth. in Engl. & Prantl, Pflanzenfam. ed. 2. **11**: 206. 1924.

Cerro de la Carpintera, no. 35562a.

Distribution: Costa Rica.

Meteoriopsis consimilis (Hampe) Broth. in Engl. & Prantl, Pflanzenfam. 1^{1}: 825. 1903.

La Hondura, no. 51819.

Distribution: Colombia.

This species is not represented in the herbarium of the New York Botanical Garden, and the above determination is based on Mitten's comparative description. The vegetative characters used to separate this plant from *M. remotifolia* are almost exactly paralleled by the present collection, so that, if the species is really a valid one, it would seem to be definitely established as an element of the Costa Rican moss flora.

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CONTRIBUTIONS

FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 26, PART 4

THE PIPERACEAE OF COSTA RICA

By WILLIAM TRELEASE

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BULLETIN OF THE UNITED STATES NATIONAL MUSEUM

PREFACE

The present number of Contributions from the United States National Herbarium, by Dr. William Trelease, University of Illinois, deals with the very numerous forms of the pepper family, Piperaceae, occurring in Costa Rica. It has been prepared in connection with Doctor Trelease's monographic study of the family as represented in North and South America. It is based upon a wide examination of material in both European and American herbaria, including a very large series of specimens collected in Costa Rica by Paul C. Standley in recent years. In all, 434 species are recognized (2 in *Pothomorphe*, 2 in *Sarcorachis*, 290 in *Piper*, 140 in *Peperomia*), more than one-half being here described as new. The location of the type specimens of the new species is indicated in each case. Nearly all are in the National Herbarium.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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THE PIPERACEAE OF COSTA RICA

By William Trelease

INTRODUCTION

As a result of the first explorations in Costa Rica by the Swiss botanists Henry Pittier and Adolf Tonduz, Monsieur Casimir De Candolle [1] in 1891 listed for that country 5 species and 2 varieties of the segregable genus *Pothomorphe*, and 1 species of the genus which I have segregated [2] as *Sarcorhachis*, in addition to 74 differentiated forms of *Piper* and 45 of *Peperomia*. Of the Pipers, 33 were described as new; and of the Peperomias, 15. A later enumeration,[3] of further collections by the same botanists, reduces the Pothomorphes to 3, but (if one may assume names listed in the first enumerations to have been held as valid except when definitely noted as synonyms, for the lists are not formally comparable) increases the differentiated Pipers to 135, of which 57 were considered new; and the differentiated Peperomias to 79, of which 24 were described as new. By far the larger part of these forms were endemic, so far as available material showed, and with South American affinities.

Since the collections by Pittier and Tonduz, made a generation ago, little has been brought to light except for a few interesting species collected by William R. Maxon, of the United States National Herbarium, until the recent exploration by Paul C. Standley. The privilege of examining his collections has led to the following mono-

[1] Bull. Soc. Bot. Belg. **30**: 197–235. 1891, preceded by a partial enumeration in volume 29, part 2, of the same Bulletin, 1890.

[2] Contr. U. S. Nat. Herb. **26**: 16. 1927.

[3] Anal. Inst. Fis.-Geogr. Costa Rica **9**:153–180. 1897. This and the list of 1891 were reprinted in the Primitiae Florae Costaricensis of Durand and Pittier, and reference is made commonly to the latter. Unfortunately the second contribution is ascribed to volume 8 of the Anales; but it actually appeared in volume 9, and, according to Monsieur Pittier, the editor, was published on November 28, 1897—three years earlier than the date of the Belgian Primitiae reprint, which is commonly referred to. The very differently repaged and recomposed reprints commonly seen measure 14×21 cm., but direct "separata" of the original constitute a veritable *édition de luxe*, the type-bed (measuring 17×23 cm.) on paper 30×41 cm., and with the unchanged pagination here cited.

graph of all of the Costa Rican Piperaceae, which, as I now see them, number 2 species of *Pothomorphe*, 2 of *Sarcorhachis*, 290 of *Piper*, and 140 of *Peperomia*—in the last two genera the novelties reaching, respectively, 159 and 71, apart from minor forms and earlier characterized varieties here given specific rank.

It is of interest to note that when Monsieur De Candolle monographed the Piperaceae for the Prodromus [4] in 1869 only a few species from Costa Rica had been seen (15 numbers of *Peperomia* and 7 of *Piper*, collected by Hoffmann); but in 1872 he published [5] the results of an examination of a somewhat larger number (14 of *Peperomia* and 21 of *Piper*), collected by Oersted.

The individual collections—including the foregoing—on which the present summation is based, number about 800 specimens of *Peperomia* and 1,300 of *Piper*, made by some 30 botanists, none of whom has preserved representatives of more than 20 Peperomias or 30 Pipers, except for Pittier and Tonduz (205 Peperomias, 523 Pipers), and Standley, Rojas Torres, and Valerio (461 Peperomias, 616 Pipers). Attention should be called to the fact that labels and references are somewhat interchanged in different herbaria as between Pittier and Tonduz, so that their numbers are preferably to be ascribed to them jointly rather than individually.

As a matter of convenience, locality data for Mr. Standley's very numerous collections are cited in greatly abbreviated form, except in the case of type specimens; a full list of the Costa Rican localities in which he collected, with altitudes, date, and geographic data, has already been published.[6]

Notwithstanding the large number of collections that have been made, the localities that they came from constitute but a small fraction of the area of Costa Rica, from which equally large and significant collections remain for the future, since in large part the species appear to be closely localized.

Apparently conditions are especially favorable for the differentiation of the Piperaceae in Costa Rica, which reaches from the Caribbean Sea to the Pacific Ocean, rising into a chain of volcanic peaks separating the two main drainage systems, between which a high central valley or meseta lies—the divide merging into that of Panama at the one end and melting away into the comparative lowlands of Nicaragua at the other. This configuration affords a great range in precipitation, sunshine and evaporation, and temperature, for parts of the lower Pacific slope are arid, while almost daily rain

[4] DC. Prodr. 16[1]: 235[bis]–471. 1869.

[5] Linnaea 37: 333–390, "1872–1873," actually of July, 1872.

[6] In a paper by Edwin B. Bartram, Costa Rican Mosses Collected by Paul C. Standley in 1924–1926. (Contr. U. S. Nat. Herb. 26: 51–114. 1928.)

and mist characterize the higher volcanic mountains; and the central meseta is comparable with the great Reventazón Valley, which falls from it on the rainy Caribbean slope.

In his publications on the Costa Rican Piperaceae, Monsieur De Candolle draws attention to the extreme richness of this country in species. The following comparative tabulation of the Piperaceae that I have recognized in several countries of comparable area not only brings this fact out but shows some very striking contrasts in the generic representation and differentiation of the family in these countries—differentiation of forms being far greater on the continent, where Pipers predominate, than on the islands, where Peperomias predominate.

Country	Area	Genera	Pothomorphe	Manekia	Sarcorhachis	Piper	Verhuellia	Piperanthera	Peperomia	Total species
	Square miles									
Costa Rica	23, 000	4	2	0	2	290	0	0	140	434
Panama	32, 400	4	2	0	1	92	0	0	44	139
Cuba	44, 200	4	2	0	0	28	2	0	61	93
Hispaniola	29, 500	6	2	1	0	28	1	1	58	92
For all West Indies[a]		7	2	1	1	66	3	1	79	153

[a] As monographed in 1903 by Monsieur De Candolle.

KEY TO GENERA

Stigmas 2 to 5 (mostly 3 or 4).
Spikes axillary or terminal; plants suffruticose.
Spikes several on a common penduncle.
1. **POTHOMORPHE** (p. 117).
Spike solitary in the leaf axil, or terminal.
2. **SARCORHACHIS** (p. 118).
Spikes opposite the leaves, solitary; plants woody. 3. **PIPER** (p. 119).
Stigma 1, more or less penicillate; plants herbaceous.
4. **PEPEROMIA** (p. 185).

1. POTHOMORPHE Miq.

Leaves distinctly peltate——1. P. peltata.
Leaves cordate, not peltate——2. P. umbellata.

1. **Pothomorphe peltata** (L.) Miq. Comm. Phyt. 37. 1840.
Piper peltatum L. Sp. Pl. 30. 1753. (Spelled "pelatum.")
Peperomia peltata Dietr. Syn. Pl. 1: 142. 1831.
Lepianthes peltatum Raf. Sylv. Tellur. 85. 1838.
Heckeria peltata Kunth, Linnaea 13: 565. 1839.
Piper ottonis Auct., as to Costa Rica.
TYPE LOCALITY: "America calidiore."
RANGE: From Cuba through the West Indies, and on the mainland from northern South America to Mexico.

COSTA RICA: La Colombiana Farm, *Standley* 36718, 36724. Hacienda de Guácimo, *United Fruit Co.* 11. Zent and Guácimo, *Tonduz* 14648. Boca de Zhorquín, *Tonduz* 8546. Boruca, *Tonduz* 3596, 4487, 4782. Matina, *Pittier* 9723. Tuis, *Tonduz* 11522, 11523. Tsuritkub, *Tonduz* 8658. Punta Mala, *Tonduz* 6808. Puerto Viejo and Sarapiquí River, *Biolley* 7440. Tsaki, *Tonduz* 9529. Shirores, *Tonduz* 9269. Río Zhorquín, "Yurquin," *Tonduz* 8546, Naranjo, *Oersted* 884a. Limón, *Stevens* 848, 894. El Arenal, Guanacaste, *Standley & Valerio* 45184. Río Corozal, *Tonduz* 9977.

2. Pothomorphe umbellata (L.) Miq. Comm. Phyt. 36. 1840.

Piper umbellatum L. Sp. Pl. 30. 1753.

Peperomia umbellata Kunth, Syn. Pl. Aequin. 1: 124. 1822.

Lepianthes umbellatum Raf. Sylv. Tellur. 85. 1838.

Heckeria umbellata Kunth, Linnaea 13: 569. 1839.

Piper dombeyanum Auct., as to Costa Rica.

Piper subpeltatum sidaefolium Auct., as to Costa Rica.

Piper umbellatum glabrum Auct., as to Costa Rica.

TYPE LOCALITY: Hispaniola.

RANGE: Through the West Indies; and on the continent from Peru and Brazil to Mexico.

COSTA RICA: Trejos, *Tonduz* 12865. Turrialba, *Oersted* 906; *Tonduz* 8344. La Palma, *Tonduz* 12608. Carrillo Road, *Tonduz* 2527. Punta Mala, *Tonduz* 6808. Tuis, *Tonduz* 8167, 11522, 11523. Cartago, *Cooper* 341, distributed as J. D. Smith 5920. San José, *Tonduz* 693, 1377, 5023. Peralta, *Stevens* 330, 342, 446. Experiencia Farm, *Stevens* 546b. La Colombiana Farm, *Standley* 36713. Las Pavas, *Standley* 36094. Tilarán, *Standley & Valerio* 44218. San Pedro de Montes de Oca to Curridabat, *Standley* 32776. San Sebastián, *Standley* 49351. Without locality, *Kuntze* 1874.

2. SARCORHACHIS Trel.

Spikes axillary ..... 1. S. naranjoana.
Spikes terminal ..... 2. S. anomala.

1. Sarcorhachis naranjoana (C. DC.) Trel. Contr. U. S. Nat. Herb. 26: 17. 1927.

Piper naranjoanum C. DC. Linnaea 37: 363. 1872.

TYPE LOCALITY: Naranjo, Costa Rica (*Oersted* 878, the type).

RANGE: Costa Rica; occurring also in Darien, Panama.

COSTA RICA: Río Hondo, plains of Santa Clara, *Cook & Doyle* 616. Hacienda de Zent, *Tonduz* 14646. Juan Viñas, *Tonduz* 1871. El Muñeco, *Standley & Valerio* 50957, with leaves 10–14×15 cm. Quebrada Serena, Tilarán, *Standley & Valerio* 46172.

2. Sarcorhachis anomala Trel., sp. nov.

A scandent soft shrub, differing from *S. naranjoana* in it terminal spike (thus resembling the Brazilian Sarcorhachis obtusa (Miq.) Trel.),[1] 4×70 mm., on a thickened peduncle 15 mm. long, the depressed berries lenticularly elongated with the rachis.

Type in the U. S. National Herbarium, no. 1,229,452, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 2–4, 1924, by Paul C. Standley (no. 37909).

RANGE: Central mountains of Costa Rica.

---

[1] *Artanthe obtusa* Miq. Syst. Pip. 416. 1844.

Piper fluminense C. DC. in DC. Prodr. 16[1]: 308. 1869.

? *Piper convallariodorum* C. DC. Bull. Herb. Boiss. II. 1: 356. 1901.

3. PIPER L.

KEY TO SPECIES

1. Leaves palmately nerved ..... 2.
   Leaves pinnately or multiple nerved ..... 16.
2. Leaves gibbous or very inequilateral at base ..... 3.
   Leaves not gibbous, nearly equilateral ..... 4.
3. Glabrous; leaves scarcely 4 by 13 cm ..... 2. P. pertractatum.
   Puberulent; leaves becoming twice as wide ..... 3. P. magnifolium.
4. Leaves elongate, not cordate ..... 5.
   Leaves usually about half as broad as long ..... 7.
5. Glabrous ..... 6.
   Obscurely papillate ..... 6. P. compactum.
   Puberulent or velvety ..... 5. P. san-marcosanum.
6. Leaves lance-oblong, 3 by 13 cm ..... 1. P. virillanum.
   Leaves subelliptic, twice as wide ..... 13.
7. Petioles not winged, with the leaves truly cordate ..... 8.
   Lower petioles often winged, then with cordate blades ..... 13.
8. Glabrous when mature ..... 9.
   Obscurely papillate ..... 6. P. compactum.
   At least locally puberulent or velvety ..... 12.
   Locally subvillous ..... 7. P. tilaranum.
9. Leaves scarcely 6 by 12 cm ..... 10.
   Leaves becoming 13 to 18 cm. long ..... 11.
   Leaves becoming distinctly larger ..... 13.
10. Nerves glandular-granular ..... 8. P. adenophlebium.
    Nerves not glandular-granular ..... 4. P. tenuipes.
11. Leaves minutely pale-dotted beneath ..... 9. P. xanthoneurum.
    Leaves neither dotted nor granular ..... 10. P. venulosum.
12. Leaves scarcely 7 by 8 cm ..... 13.
    Leaves becoming 10 to 13 cm. long ..... 11. P. recuperatum.
13. Glabrous when mature ..... 14.
    At least locally velvety or hirtellous ..... 15.
14. Leaves scarcely 8 by 16 cm ..... 13. P. dissimulans.
    Leaves becoming much larger; stigmas on a disk ..... 14. P. smilacifolium.
15. Leaves scarcely 7 by 11 cm ..... 12. P. nicoyanum.
    Leaves becoming 16 by 18 cm ..... 15. P. san-joseanum.
16. Midrib subequally branched nearly throughout ..... 17.
    Without strong ascending branches upward ..... 30.
17. Leaf-base appreciably acute or else equilateral ..... 18.
    Leaf-base appreciably obtuse or very inequilateral ..... 22.
18. Leaves scarcely 7 cm. wide ..... 19.
    Leaves becoming fully 10 cm. wide ..... 22.
19. Spikes short (25 mm.) and pointed ..... 34. P. candelarianum.
    Spikes elongate ..... 20.
20. Leaves 3 or 5 nerved from near the base ..... 29. P. guanacastense.
    Leaves not triple-nerved ..... 21.
21. Fruit deeply sulcate ..... 30. P. acuminatissimum.
    Fruit not deeply sulcate ..... 27. P. arielanum.
22. Leaf-base nearly or quite equilateral ..... 23.
    Leaf-base distinctly inequilateral ..... 28.
23. Leaves glabrous above ..... 24.
    Leaves pubescent on upper side ..... 27.

24. Leaves glabrous beneath; nerves not impressed ..... 25.
Leaves ciliate, or the many nerves puberulent or impressed ..... 27.
25. Leaves up to 5 by 10 cm ..... 28. P. cyanophyllum.
Leaves becoming distinctly larger ..... 26.
26. Leaves 8 to 10 cm. wide ..... 24. P. asymmetricum.
Leaves becoming one-half wider ..... 25. P. borucanum.
27. Leaves subovate; nerves not impressed ..... 26. P. prismaticum.
Leaves subelliptic; nerves impressed ..... 21. P. sublineatum.
28. Leaves scarcely 12 cm. long, thin and green ..... 16. P. tuberculatum minus.
Leaves distinctly larger, firm ..... 29.
29. Leaves lance-oblong, acute-based ..... 20. P. longepetiolatum.
Leaves broadly oblong ..... 19. P. pseudobumbratum.
Leaves lance-ovate ..... 18. P. obumbratifolium.
Leaves elliptic-ovate ..... 17. P. corozalanum.
30. Leaf-base appreciably acute ..... 31.
Leaf-base appreciably obtuse, or cordate at least on one side ..... 63.
31. Petiole characteristically winged; stigmas borne on a style ..... 119.
Petiole not winged, or else the stigmas sessile ..... 32.
32. Leaves glabrous above, between the nerves ..... 33.
Leaves granular or scabrous or pubescent on both sides ..... 213.
33. Leaves glabrous beneath ..... 34.
Leaves puberulent or pubescent beneath, at least along the nerves ..... 54.
34. Leaves about half as broad as long ..... 35.
Leaves more elongate ..... 40.
35. Spikes short and thick (3 by 25 mm.) ..... 95. P. gracilipedunculum.
Spikes longer and more slender ..... 36.
36. Leaves callous-inrolled at base ..... 204. P. catacryptum.
Leaves not bicalloused at base ..... 37.
37. Leaves barely 4 by 9 cm ..... 38.
Leaves 4 to 5 by 12 cm., lance-ovate ..... 207. P. elliptico-lanceolatum.
Leaves about 6 by 14 cm ..... 39.
Leaves 7 to 9 by 15 cm., elliptic-ovate ..... 77. P. caeruleifolium.
Leaves distinctly larger ..... 22. P. brenesii.
38. Leaves elliptic ..... 210. P. leptoneuron.
Leaves rhombic-ovate ..... 216. P. pablense.
39. Spikes thick, with sterile tip ..... 97. P. decurrens.
Spikes slender ..... 96. P. surubresanum.
40. Leaves bicalloused at base ..... 203. P. urophyllum.
Lowest leaves sometimes truncate-cordate ..... 110.
Leaves neither calloused nor cordate ..... 41.
41. Leaves lance-elliptic ..... 42.
Leaves elliptic-suboblong ..... 47.
Leaves lanceolate ..... 53.
42. Leaves scarcely 12 cm. long ..... 43.
Leaves about 15 cm. long ..... 46.
43. Spikes 30 to 40 mm. long ..... 205. P. tractifolium.
Spikes more elongate ..... 44.
44. Spikes filiform ..... 45.
Spikes 3 mm. thick ..... 218. P. coarctatum.
45. Twigs scarcely sulcate ..... 206. P. concinnifolium.
Twigs strongly sulcate in drying ..... 217. P. carnosicaule.
46. Spikes 50 to 70 mm. long ..... 166. P. arundinetorum.
Spikes about 100 cm. long ..... 219. P. tuisanum.

47. Spikes thick, with slender tip——59. P. impube.
Spikes slenderer or longer——48.
48. Plants scandent——211. P. xanthostachyum.
Plants not scandent——49.
49. Spikes filiform——50.
Spikes 3 mm. thick——51.
50. Nerves from the lower third——215. P. heptaneurum.
Nerves from the lower half——212. P. stenocladum.
51. Leaf-base slightly inequilateral——208. P. diquisanum.
Leaf-base essentially equiliateral——52.
52. Lower nerves approximate——214. P. costaricense.
Nerves not congested below——53.
53. Spikes filiform——209. P. tenuispicum.
Spikes 3 mm. thick——213. P. stenocladophorum.
54. Leaves about half as broad as long——55.
Leaves more elongate——58.
55. Petioles winged; stigmas borne on a style——119.
Petioles not winged, or else stigmas sessile——56.
56. Spikes filiform——57.
Spikes 3 mm. thick——176. P. esquivelanum.
57. Leaves up to 8 by 16 cm——175. P. oppressum.
Leaves nearly 10 by 20 cm——174. P. epigynium.
58. Petioles winged; stigmas born on a style——119.
Petioles not winged, or else stigmas sessile——59.
59. Leaves linear-oblong, 2 by 8 cm——224. P. linearifolium.
Leaves lance-oblong, twice as long——60.
Leaves lanceolate or subelliptic, still larger——62.
60. Lower petioles winged; glandular-granular——177. P. machadoanum.
Petioles not winged——61.
61. Plant scandent——199. P. silvivagum.
Plant not scandent——179. P. nodosum.
62. Nerves puberulent beneath——185. P. disparipes.
Nerves hispid or silky beneath——180. P. coactoris.
Pubescence subvillous——181. P. villistipulum.
63. Leaves distinctly peltate, large——64.
Leaves not peltate——65.
64. Leaves regularly ovate, glabrous——104. P. peltaphyllum.
Leaves subcordate-ovate, glabrous——105. P. veraguense.
Leaves cordate-truncate, subpentagonal, pubescent——106. P. copeyanum.
65. Leaves cordate or auricled, large; petiole long——66.
Leaves shallow or subtruncate-cordate; petiole moderately long or thick——96.
Leaves short-petioled, if cordate——113.
66. Auricles acute; stigmas borne on a style——107. P. sagittifolium.
Auricles or basal lobes not acute——67.
67. Petiole rather thick and winged, or basal lobes unequal——68.
Petiole slender; basal lobes subequal——90.
68. Sinus lateral, or one lobe large or auricle-like——69.
Sinus basal, the lobes scarcely auricle-like if unequal——82.
69. Petiole equilong on both sides——70.
Petiole observably longer on one side——75.
70. Leaves subpandurately elliptic——108. P. glabrifolium.
Leaves subpandurately oblong——120. P. cenocladum.
Leaves elliptic——109. P. pseudo-glabrifolium.
Leaves (with basal auricle) subobovate——71.

71. Petiole shorter than the auricle---121. P. signatum.
Petiole about equaling the auricle---72.
Petiole longer than the auricle---73.
72. Leaves not bullulate; plant subhirsute---122. P. ciliatifolium.
Leaves bullulate; plant velvety---123. P. bullulaefolium.
73. Nerves puberulent beneath---124. P. tinctum.
Pubescence subvillous---74.
74. Auricle as broad as long---125. P. biseriatum.
Auricle twice as long as broad---126. P. dasypogon.
75. Spikes 5 to 6 mm. thick---76.
Spikes long and slender---77.
76. Petiole fleshy-warty; leaves ovate, puberulent---127. P. magnilimbum.
Petiole not fleshy-warty; leaves villous---128. P. fimbriulatum.
77. Pubescence villous---78.
Puberulent or short-pubescent---80.
78. Leaves bullulate, villous---135. P. silvicola.
Leaves not bullulate---79.
79. Tomentulose-subvillous---131. P. exiguispicum.
Essentially glabrous---130. P. pseudo-fimbriulatum.
80. Peduncle nearly 10 cm. long---132. P. perlongipes.
Peduncle much shorter---81.
81. Leaves somewhat pubescent on both sides---133. P. auritum amplifolium.
Leaves glabrous beneath---134. P. auritifolium.
82. Leaves subpandurately obovate---83.
Leaves broadly ovate---84.
83. Nerves hirtellous beneath; twigs crisp-velvety---129. P. pentagonum.
Nerves obscurely puberulent---110. P. pacacanum.
84. Leaves scarcely longer than broad---111. P. subfuscum.
Leaves more elongate---85.
85. Not fleshy-warty---86.
Nodes and petioles fleshy-warty---89.
86. Basal lobes unequal---87.
Basal lobes nearly equal---88.
87. Leaves broadest at base---112. P. ceibense.
Leaves somewhat narrowed below---113. P. neurostachyum.
88. Nerves puberulent beneath---114. P. escuadranum.
Pubescence crisp-velvety---115. P. irrasum.
Pubescence crisp-villous---117. P. aserrianum.
89. Petiole shorter than the lobes---118. P. cincinnatum.
Petiole longer than the lobes---116. P. palmanum.
Petiole subequal to the lobes---119. P. clavuliger.
90. Nerves deeply impressed---78. P. corrugatum.
Nerves scarcely impressed---91.
91. Petiole winged to the end---79. P. gibbosum.
Petiole usually unwinged---92.
92. Sinus U-shaped---93.
Sinus contracted above the base; nerves yellow---81. P. omega.
93. Drying thin and green---94.
Drying firm and bluish---110.
94. Glabrous---95.
Nerves somewhat puberulent beneath---80. P. paulownifolium.
95. Blade not crossing the petiole---82. P. carrilloanum.
Margin connate across the petiole---83. P. vallicolum.

96. Petiole stout, winged; leaves large——97.
Petiole slender——102.
97. Leaf-base obliquely rounded; petiole warty——136. **P. mirabile.**
Leaf-base narrowly cordate——98.
Leaf-base subtruncate-cordate——99.
98. Leaves elliptic——137. **P. evasum.**
Leaves ovate——138. **P. longevillosum.**
99. Leaves dark-granular——139. **P. pittieri.**
Leaves not glandular-roughened——100.
100. Nerves appressed-pubescent beneath——101.
Villous-hirsute——141. **P. riparense.**
101. Nodes and petiole fleshy-warty——140. **P. trimetrale.**
Not fleshy-warty——142. **P. euryphyllum.**
102. Petioles characteristically winged——103.
Only the longest petioles, if any, winged above the base——108.
103. Spikes elongate——104.
Spikes short and thick, with sterile tip——119.
104. Leaves suboblong——93. **P. melanocladum.**
Leaves lanceolate——72. **P. aereum.**
Leaves broadly ovate——105.
Leaves round-ovate, equilateral——106.
105. Stigmas on at least a short style——119.
Stigmas subsessile——73. **P. deflexispicum.**
106. Plant scandent; leaves 10 cm. wide——84. **P. aragonense.**
Plant bushy——107.
107. Leaves 10 cm. wide——85. **P. perpuberulum.**
Leaves becoming 15 by 15 cm.——86. **P. cercidiphyllum.**
108. Leaves broadly ovate——109.
Leaves obliquely lanceolate——112.
109. Leaves drying thin and green——74. **P. escasuense.**
Leaves drying firm and bluish——110.
110. Upper leaves narrow and acute-based——75. **P. tacamahaca.**
Leaves all ovate——76. **P. subvariabile.**
Leaves obliquely and broadly elliptic——111.
111. Nerves puberulent beneath——89. **P. cyphophyllum.**
Nerves crisp-pubescent beneath——92. **P. sinuatifolium.**
112. Petiole glabrous——90. **P. falcigerum.**
Petiole puberulent——91. **P. sublaevifolium.**
113. Leaves oblanceolate, very obliquely auricled——114.
Leaves lance-oblong, deeply cordulate——227. **P. disparispicum.**
Leaves lanceolate, obliquely cordulate——149. **P. subaspericaule.**
Leaves lance-ovate, ovate, or subobovate, obliquely subcordulate——115.
Leaves not as above——118.
114. Petiole glabrate; nerves puberulent——144. **P. auriculiferum.**
Petiole appressed-pubescent——143. **P. otophorum.**
115. Glabrous; leaves falcately pointed——148. **P. celatipetiolum.**
Nerves puberulent beneath——147. **P. disparifolium.**
Crisp-hairy beneath; twigs and upper side villous——146. **P. insolens.**
Generally villous——116.
116. Leaves scabrous——145. **P. biauritum.**
Leaves scarcely scabrous, small——117.
117. Pubescence stiff beneath——161. **P. polytrichum.**
Pubescence soft——160. **P. rhodostachyum.**

118. Petiole mostly winged; stigmas on a style 119
Stigmas sessile, even though petiole winged 156
119. Leaves less than twice as long as broad, or elliptical if slightly longer 120
Leaves about twice as long as broad 133
Leaves more elongate 143
120. Peduncle filiform; villous throughout 121
Peduncle not filiform and villous 122
121. Leaves short-acuminate; spikes with hairy tip ..... 31. P. urostachyum.
Leaves narrowly caudate ..... 32. P. arcte-acuminatum.
122. Leaves (mature) glabrous above between the nerves 123
Leaves pubescent on both sides 131
123. Leaves glabrous beneath 124
Nerves, at least, pubescent beneath 126
124. Leaves glandular-granular 125
Leaves scarcely granular ..... 48. P. submultiplinerve.
125. Upper leaves elliptic and acute-based ..... 43. P. pachystylum.
Leaves all equilaterally ovate ..... 47. P. labeculatum.
126. Spikes thick and short (10 by 20 mm.) 127
Spikes slender or elongate 128
127. Leaves ovate ..... 39. P. cuspidispicum.
Leaves elliptic ..... 38. P. pubinerve.
128. Petiole winged throughout 129
Petiole winged only below the middle ..... 49. P. nudifolium.
Petiole winged only near the base; leaves bullulate ..... 33. P. irazuanum.
129. Leaf-base appreciably acute ..... 45. P. annulatum.
Leaf-base obtuse or subcordulate 130
130. Leaves scarcely 6 by 12 cm ..... 53. P. altevaginans.
Leaves becoming 7 by 16 cm ..... 55. P. operosum.
Leaves becoming 9 by 18 cm ..... 57. P. zhorquinense.
131. Petiole 5 mm. long ..... 41. P. dryadum.
Petiole and spikes elongate 132
132. Leaves strongly bullulate-rugose ..... 33. P. irazuanum.
Leaves not bullulate ..... 42. P. rufescens.
133. Leaves (mature) glabrous above between the nerves 134
Leaves pubescent on both sides ..... 40. P. viridispicum.
134. Leaves glabrous beneath 135
Nerves, at least, pubescent beneath; spikes elongate 137
135. Spikes short and thick 136
Spikes elongate ..... 46. P. pseudopropinquum.
136. Flowering internodes short ..... 36. P. curtispicum.
Flowering internodes elongate ..... 37. P. ripicola.
137. Petioles and twigs glabrate 138
Petioles (and twigs below them) somewhat hairy 139
138. Nerves obscurely puberulent ..... 67. P. orosianum.
Nerves velvety-subhirtellous ..... 44. P. viridifolium.
Nerves hirtellous-subhirsute ..... 66. P. brevistylum.
139. Leaves oblique, subfalcately pointed 140
Leaves nearly equilateral, or else short-acuminate 141
140. Pubescence appressed-silky ..... 56. P. subsericeum.
Pubescence upcurved-subvillous ..... 54. P. pexum.
141. Nerves subappressed-pubescent 142
Nerves subvillous-hirsute ..... 73. P. deflexispicum.
142. Nerves subcrisp-hirtellous ..... 58. P. detonsum.
Nerves appressed-pubescent ..... 52. P. jubatum.

143. Leaves more than one-third as broad as long ..... 144.
Leaves relatively narrower ..... 149.
144. Leaves glabrous ..... 145.
Nerves, at least, puberulent or pubescent beneath ..... 147.
145. Leaves obliquely subcordulate ..... 69. P. coilostachyum.
Leaves scarcely cordulate ..... 146.
146. Leaves green ..... 46. P. pseudopropinquum.
Leaves bronzing; style obsolete ..... 72. P. aereum.
147. Leaves not cordulate, scarcely 18 cm. long ..... 137.
Leaves cordulate at the narrowed base ..... 148.
148. Bracts not calcarate ..... 50. P. chirripoense.
Bracts calcarately thickened ..... 51. P. calcaratum.
149. Leaf-base not truncate ..... 150.
Leaf-base obliquely truncate-cordulate; subvillous ..... 155.
150. Petioles and twigs glabrous ..... 151.
Petioles, and usually twigs below them, pubescent ..... 152.
151. Spikes thick and short (10 by 20 mm.) ..... 35. P. artanthopse.
Spikes slenderer and longer ..... 68. P. arcessitum.
152. Leaves at least minutely glandular-granular ..... 153.
Leaves not glandular-granular ..... 154.
153. Nerves puberulent beneath ..... 61. P. tarrazuense.
Nerves crisp-pubescent beneath ..... 62. P. subzhorquinense.
154. Petiole subpuberulent ..... 65. P. calvirameum.
Petiole hirsute ..... 64. P. sinugaudens.
Petiole subvillous ..... 60. P. figlinum.
Crisp-villous ..... 63. P. ripense.
155. Leaves glabrous above ..... 71. P. pallidifolium.
Leaves mostly hairy on both sides ..... 70. P. tonduzii.
156. Mature leaves glabrous above between the nerves ..... 157.
Leaves rough or pubescent on both sides ..... 213.
157. Plants spreading or repent or scandent ..... 158.
Plants not repent or scandent ..... 169.
158. Leaves glabrous or quickly glabrescent beneath ..... 159.
Nerves, at least, pubescent beneath ..... 166.
159. Twigs glabrous ..... 160.
Twigs somewhat pubescent; leaves elongate ..... 165.
160. Leaves about half as broad as long ..... 161.
Leaves more elongate ..... 162.
161. Leaves scarcely 6 cm. wide ..... 170. P. bryogetum.
Leaves nearly twice as wide ..... 165. P. concepcionis.
162. Midrib distinctly nearer one side ..... 200. P. reptabundum.
Midrib subcentral ..... 163.
163. Leaves about 3 by 11 cm ..... 194. P. dotanum.
Leaves 5 to 6 cm. wide ..... 164.
164. Nerving of leaves pinnate ..... 166. P. arundinetorum.
Nerving multiple ..... 169. P. pseudo-aduncum.
165. Leaves scant 4 by 11 cm ..... 198. P. carpinteranum.
Leaves 5 by 16 cm ..... 201. P. flavirameum.
166. Nerves subvelvety beneath ..... 168. P. pendens.
Nerves puberulent beneath ..... 84. P. aragonense.
Nerves appressed-pubescent beneath ..... 167.
167. Many leaves acute-based ..... 199. P. silvivagum.
Leaves scarcely acute-based ..... 168.

168. Leaves not rugose---190. **P. subdivaricatum.**
Leaves becoming subrugose---192. **P. zonulatispicum.**
169. Leaves glabrous or quickly glabrescent beneath---170.
Nerves, at least, puberulent or pubescent beneath---187.
170. Leaves about half as broad as long, 7 to 10 cm. wide---171.
Leaves more elongate, or much smaller---176.
171. Leaves about 7 cm. wide---172.
Leaves about 10 cm. wide---173.
172. Leaves ovate-elliptic---77. **P. caeruleifolium.**
Leaves subquadrate---244. **P. subquadratum.**
173. Nerves from the lower third---163. **P. scleromyelum.**
Nerves from the lower half---174.
174. Leaf-base equilateral---175.
Leaf-base inequilateral---154. **P. anisophyllum.**
175. All except 2 nerves basal---87. **P. dumetorum.**
Eight nerves from above the base---88. **P. zentanum.**
176. Leaves scant 4 by 15 cm---177.
Leaves becoming 5 to 7 or 9 cm. wide---180.
177. Leaf-base inequilateral; twigs slender, granular---178.
Leaf-base equilateral---179.
178. Petiole 10 mm. long---197. **P. verruculosum.**
Petiole scarcely one-half as long---196. **P. verruculigerum.**
179. Upper leaves acute-based---37.
Leaves all rounded at base---171. **P. matinanum.**
180. Leaves scant 16 cm. long---181.
Leaves becoming 16 to 20 cm. long---184.
181. Leaves falcately pointed---182.
Leaves not falcate---183.
182. Nerves 5 pairs---98. **P. micranthera.**
Nerves 4 pairs, impressed---23. **P. seductum.**
183. Spikes filiform---172. **P. cabagranum.**
Spikes 3 by 70 mm---99. **P. opacibracteum.**
184. Leaves obscurely unguiculate at base---100. **P. unguiculiferum.**
Leaves not unguiculate---185.
185. Leaves lance-oblong---186.
Leaves lanceolate---102. **P. terrabanum.**
Leaves elliptic-oblanceolate---103. **P. longistipulum.**
186. Leaves cordulate---101. **P. xiroresanum.**
Leaves not cordulate---167. **P. sulcinervosum.**
187. Leaves about half as broad as long---188.
Leaves more elongate---198.
188. Leaves scarcely 6 by 12 cm---189.
Leaves becoming appreciably larger---191.
189. Twigs striately hirtellous-hirsute---220. **P. striatum.**
Twigs somewhat hirsute-subvillous---190.
190. Some leaves rotund---221. **P. guacimonum.**
Leaves ovate-subelliptic---222. **P. poasanum.**
191. Leaves obliquely cordulate---162. **P. nigricaule.**
Leaves scarcely cordulate---192.
192. Leaf-base nearly equilateral---193.
Leaf-base somewhat inequilateral---195.
193. Twigs somewhat crisp-pubescent---223. **P. silvanorum.**
Twigs glabrous or quickly glabrescent---194.

194. Petiole scarcely 10 mm. long——152. P. vicinum.
Petiole becoming twice as long——151. P. chrysostachyum.
195. Nerves velvety beneath——196.
Nerves appressed-pubescent beneath——197.
Nerves subcrisp-pubescent beneath——155. P. pseudodilatatum.
196. Spikes about 50 mm. long——157. P. uvitanum.
Spikes twice as long——158. P. alajuelanum.
197. Twigs and petioles glabrous——173. P. blepharilepidum.
Twigs and petioles puberulent——150. P. virgultorum.
Twigs transiently soft-pubescent——189. P. pubens.
198. Leaf-base equilateral; nerves impressed——199.
Leaf-base inequilateral or else the nerves not impressed——200.
199. Spikes hooked; peduncle long——225. P. pseudo-lanceaefolium.
Spikes not strongly curved——164. P. subsessilifolium.
200. Leaves obliquely cordulate, over 15 cm. long——201.
Leaves scarcely cordulate, or else smaller——202.
201. Nerves puberulent beneath——149. P. subaspericaule.
Nerves appressed-hirtellous——150. P. virgultorum.
Nerves transiently villous——159. P. villosisquamulum.
202. Leaves scarcely 7 by 15 cm——203.
Leaves becoming somewhat larger——208.
203. Nerves appressed-pubescent beneath——204.
Nerves crisp-pubescent beneath——207.
204. Twigs quickly glabrescent——189.
Twigs more persistently hispid-hirsute——205.
Twigs subvillous——202. P. pilibaccum.
205. Pubescence of twigs upcurved——190. P. subdivaricatum.
Pubescence retrorse——206.
206. Twigs pale-granular——192. P. zonulatispicum.
Twigs scarcely granular——191. P. rotundibaccum.
207. Bracts gray; peduncle 20 mm. long——193. P. ejuncidum.
Bracts white; peduncle shorter——195. P. pseudo-albuginiferum.
208. Nerves puberulent or papillate beneath——209.
Nerves crisp-hairy beneath——182. P. tabanicidum.
209. Twigs glabrous——210.
Twigs transiently puberulent——187. P. imparipes.
Twigs crisp-pubescent——183. P. barbulatum.
210. Petiole glabrous——211.
Petiole puberulent——184. P. umbricola.
211. Nerves rough; twigs granular——186. P. papulatum.
Nerves scarcely roughened——212.
212. Leaves scarcely 5 cm. wide——188. P. leptocladum.
Leaves 6 to 8 cm. wide——185. P. disparipes.
Leaves 9 cm. wide——178. P. brachistophodum.
213. Leaves about half as broad as long——214.
Leaves more elongate——244.
214. Leaves scarcely scabrous——215.
Leaves granular-roughened or scabrous above——219.
215. Pubescence appressed; leaves scarcely rugose——216.
Pubescence subhirsute——153. P. pelliticaule.
Pubescence villous——218.
216. Leaves scarcely 8 by 15 cm——217.
Leaves 8 to 9 by 16 to 19 cm——285. P. domingense.

217. Peduncle about 15 mm. long---252. **P. salinasanum.**
Peduncle one-half as long---262. **P. verbenanum.**
218. Leaves subcordulate---94. **P. tortuosipilum.**
Leaves not cordulate---156. **P. zacatense.**
219. Pubescence of nerves appressed---220.
Pubescence crisp or spreading---233.
220. Leaves somewhat rugose, commonly 15 to 18 cm. long---221.
Leaves scarcely rugose---222.
221. Leaves subcordulate, inequilateral---262. **P. verbenanum.**
Leaves scarcely cordulate---256. **P. spicilongum**
222. Twigs pale-granular---223.
Twigs scarcely granular---224.
223. Leaves 6 by 12 cm---265. **P. carminis.**
Leaves 16 to 19 cm. long---272. **P. punctiunculatum.**
224. Leaves 12 to 15 cm. long---225.
Leaves becoming 15 to 20 cm. long---226.
225. Leaves becoming lepidote---274. **P. injucundum.**
Leaves scarcely lepidote---252. **P. salinasanum.**
226. Leaves becoming rugose---227.
Leaves scarcely rugose---243. **P. tsuritkubense.**
227. Twigs pale-granular---228.
Twigs scarcely granular---229.
228. Leaves about 5 by 10 cm---229. **P. cartagoanum.**
Leaves about 8 by 15 cm---239. **P. bisasperatum.**
229. Leaves about 12 cm. long---230.
Leaves 13 to 15 cm. long---232.
Leaves becoming 18 cm. long---253. **P. griseo-pubens.**
230. Twigs hispid; bracts white---275. **P. albuginiferum.**
Twigs hirsute-subvillous---231.
231. Leaves brown-granular---269. **P. fusco-granulatum.**
Leaves white-scabrous---237. **P. reventazonis.**
232. Leaf-base acute---236. **P. echeverrianum.**
Leaf-base obtuse---240. **P. pavasense.**
233. Twigs pale-granular---234.
Twigs scarcely granular---236.
234. Leaves about 10 cm. long---231. **P. gonagricum.**
Leaves 12 to 15 cm. long---235.
235. Spikes 4 by 50 to 60 mm---277. **P. lanatibracteum.**
Spikes twice as long---270. **P. baculiferum.**
236. Leaves about 10 cm. long---237.
Leaves 12 to 15 cm. long---239.
Leaves becoming 15 to 20 cm. long---241.
237. Leaves blunt-pointed---230. **P. sepicola.**
Leaves sharply acuminate---238.
238. Peduncle 10 mm. long---233. **P. curvipilum.**
Peduncle one-half as long---232. **P. pejivallense.**
239. Twigs subtomentose or subvillous---262. **P. verbenanum.**
Twigs hispid-hirsute---240.
240. Leaves glistening-punctulate---274. **P. injucundum.**
Leaves white-scabrous---263. **P. valetudinarii.**
Leaves transiently pubescent---266. **P. coronatibracteum.**
241. Leaves glistening-punctulate---268. **P. scintillans.**
Leaves white-scabrous---242.

242. Spikes not strongly curved—243.
Some spikes curved—250.
243. Leaves lepidote—272. P. punctiunculatum.
Leaves scarcely lepidote—243. P. tsuritkubense.
244. Leaves scarcely scabrous—245.
Leaves granular-roughened or scabrous above—247.
245. Nerves appressed-hispid—189. P. pubens.
Leaves appressed-hirsute—246.
Leaves subvillous—156. P. zacatense.
246. Spikes filiform—284. P. perhispidum.
Spikes 3 mm. thick—238. P. pseudofuligineum.
247. Pubescence of nerves appressed—248.
Pubescence of nerves spreading—260.
248. Twigs pale-granular—249.
Twigs scarcely granular—253.
249. Leaves some 12 to 15 cm. long—250.
Leaves becoming 15 to 20 cm. long—273. P. emollitum.
250. Spikes not strongly curved—251.
Spikes hooked or strongly curved—226. P. celitidifolium.
251. Twigs glabrous—248. P. anguillaespicum.
Twigs at least transiently pilose or hispid—252.
252. Leaves minutely granular—283. P. ventoleranum.
Leaves white-scabrous—276. P. phanerolepidum.
253. Leaves about 12 to 15 cm. long—254.
Leaves becoming 15 to 20 cm. long—257.
254. Leaves very lepidote—267. P. subhirsutum.
Leaves scarcely lepidote—255.
255. Twigs glabrous—259. P. torresanum.
Twigs hispid—234. P. pergeniculatum.
Twigs transiently subvillous—256.
256. Leaves lanceolate—242. P. cookii.
Leaves oblanceolate—250. P. oblanceolatum.
257. Leaves caudately pointed—258.
Leaves scarcely caudate—259.
258. Pubescence yellow—286. P. flavescens.
Pubescence not yellow—287. P. suberythrocarpum.
259. Peduncle velvety—260. P. inhorrescens.
Peduncle appressed-pubescent—264. P. submolle.
260. Leaves becoming rugose—261.
Leaves scarcely rugose—274.
261. Twigs pale-granular—262.
Twigs scarcely granular—265.
262. Leaves 4 by 10 cm., caudate—258. P. caudatifolium.
Leaves 12 to 16 cm. long—289. P. rugosifolium.
Leaves becoming 15 to 18 or 20 cm. long—263.
263. Petiole 10 to 15 cm. long—264.
Petiole one-half as long—261. P. squali-pelliculum.
264. Nerves flattened above—239. P. bisasperatum.
Nerves convallate above—254. P. leucophlebium.
265. Leaves about 10 to 15 cm. long—266.
Leaves becoming 15 to 20 cm. long—272.
266. Leaves very bullulate—267.
Leaves openly lacunose—289. P. rugosifolium.
Leaves merely rugose—268.

267. Leaf-base appreciably obtuse ..... 290. P. pseudopsis.
Leaf-base appreciably acute ..... 288. P. pileatum.
268. Leaf-base appreciably obtuse ..... 269.
Leaf-base appreciably acute; twigs villous ..... 246. P. laevius.
269. Leaves scabro-hispid ..... 270.
Leaves scabro-hirsute ..... 271.
270. Peduncle scarcely 5 mm. long ..... 275. P. albuginiferum.
Peduncle twice as long ..... 263. P. valetudinarii.
271. Spikes subfiliform ..... 251. P. comatum.
Spikes 3 mm. thick ..... 249. P. dumeticola.
Spikes 4 by 75 mm ..... 282. P. capacibracteum.
272. Leaf-hairs stiff ..... 261. P. squali-pelliculum.
Leaf-hairs soft except at base ..... 273.
273. Petiole 10 to 15 mm. long ..... 254. P. leucophlebium.
Petiole scarcely 10 mm. long ..... 245. P. machucanum.
274. Twigs pale-granular ..... 275.
Twigs scarcely granular ..... 283.
275. Leaves 10 to 15 cm. long ..... 276.
Leaves becoming 15 to 20 cm. long ..... 281.
276. Twigs quickly glabrescent ..... 277.
Twigs persistently pubescent ..... 279.
277. Leaf-base appreciably obtuse ..... 279. P. pullibracteatum.
Leaf-base appreciably acute ..... 278.
278. Leaves granular and lepidote ..... 281. P. curridabatanum.
Leaves white-scabrous ..... 257. P. trichophlebium.
279. Twigs hispid ..... 280.
Twigs hirsute ..... 247. P. granulatum.
280. Peduncle short ..... 255. P. scalpens.
Peduncle elongate ..... 278. P. lanosibracteum.
281. Leaves with hard-based hairs above ..... 241. P. talamancanum.
Leaves not hirsute above ..... 282.
282. Leaves lepidote ..... 267. P. subhirsutum.
Leaves scarcely lepidote ..... 280. P. fusco-bracteatum.
283. Leaves about 12 to 15 cm. long ..... 284.
Leaves becoming 15 to 20 cm. long ..... 287.
284. Leaves not hirsute above ..... 285.
Leaves with hard-based hairs above ..... 240. P. pavasense.
285. Leaf-base appreciably obtuse ..... 250. P. oblanceolatum.
Leaf-base appreciably acute ..... 286.
286. Twigs hispid or crisp-pubescent ..... 271. P. rectamentum.
Twigs villous-hirsute ..... 235. P. genuflexum.
287. Spikes often curved ..... 228. P. aduncifolium.
Spikes essentially straight ..... 256. P. spicilongum.

1. Piper virillanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 158. 1897.

TYPE LOCALITY: Río Virilla, San José, Costa Rica (*Tonduz* 9831, the type; distributed also as J. D. Smith 7145).

RANGE: Upper Pacific slope of Costa Rica.

COSTA RICA: Río Virilla, *Tonduz* 10127 (distributed also as J. D. Smith 7301).

2. Piper pertractatum Trel., sp. nov.

A shrub, nodose, glabrous; flowering internodes slender and short; leaves lanceolate, protracted-acute, gibbously oblique, moderate (3.5 to 4×11 to 13

cm.), palmately 3 or obscurely 5 or 7 nerved; petiole short (scarcely 10 mm.), not winged; spikes as yet some 2 × 50 mm.; peduncle slender, 10 to 15 mm. long; bracts concave.

Type in the U. S. National Herbarium, no. 1,080,638, collected at Nuestro Amo, Alajuela, Costa Rica, February, 1919, by Otón Jiménez.

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Rodeo de Pacaca, *Pittier* 3294. Tilarán, *Standley & Valerio* 45694, 45710. Río Febas, San Juan, ? *Jiménez* 817.

3. Piper magnifolium (C. DC.) Trel.

Piper pseudo-lindenii magnifolium C. DC. Linnaea 37: 336. 1872.

TYPE LOCALITY: Naranjo, Costa Rica (*Oersted*).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tuis, *Tonduz* 12293. Tsaki, *Tonduz* 9530. Hacienda de Zent, *Tonduz* 9530, 14650.

4. Piper tenuipes C. DC. Bot. Gaz. 70: 174. 1920.

Piper medium Auct., as to Costa Rica.

TYPE LOCALITY: San Ramón, Costa Rica (*Brenes* 14193, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: San Ramón, *Brenes* 14196, 14502. Also, in varying forms: Naranjos Agrios, *Standley & Valerio* 46418, 46488. Los Ayotes, *Standley & Valerio* 45562. Quebrada Serena, *Standley & Valerio* 46226. La Tejona, *Standley & Valerio* 45756, 45854. Capulín, Río Grande de Tárcoles, *Standley*, 40147. Bay of Salinas, *Pittier* 2924. Nicoya, *Tonduz* 13938. Matambú, *Cook & Doyle* 703.

5. Piper san-marcosanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 158. 1897.

TYPE LOCALITY: San Marcos, Costa Rica (*Tonduz* 7557, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Ventolera, Volcán de Poás, *Standley* 34540. Viento Fresco, Alajuela, *Standley & Torres* 47928.

6. Piper compactum Trel., sp. nov.

A dense shrub, 2 to 5 meters tall, nodose; flowering internodes slender, elongate, drying dark, glabrous; leaves lance- or ovate-elliptic, mucronately long-acuminate, acute at base or less commonly rounded, moderately small (4.5 to 5×10 to 12 cm.), palmately 5 or obscurely 7 nerved, typically minutely papillate at base of the nerves beneath; petiole rather short (10 to 15 mm.), slender, not winged or on the lower leaves winged to the middle, obscurely papillate; spikes in fruit 4×60 to 80 mm.; peduncle slender, 15 mm. long, papillate; bracts angular-subpeltate, ciliate; stigmas 3, sessile; berries flask-shaped, somewhat granular.

Type in the U. S. National Herbarium, no. 1,307,255, collected near Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1925, by Paul C. Standley (no. 41801).

RANGE: High central divide of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley & Valerio* 43184, broader-leaved.

7. Piper tilaranum Trel., sp. nov.

A shrub 2 to 4 meters tall; nodes sparsely crisp-villous; leaves round-ovate, mucronately long-acuminate, rounded below or subacute at the very base, rather large (5.5×12 to 11×16 cm.), palmately 5 nerved, the nerves sparsely crisp-villous at base on both sides; petiole 10 to 20 mm. long, not winged, sparsely villous; spikes (young) 3×60 mm.; peduncle 10 mm. long, loosely villous; bracts concave, white-pubescent; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,464, collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 46596).

RANGE: Pacific slope of central Costa Rica.

COSTA RICA: Tilarán, *Standley & Valerio* 44182, 44247, 46085, 46589, 46995.

8. Piper adenophlebium Trel., sp. nov.

A small shrub, scarcely 2 meters tall; flowering internodes transiently puberulent; leaves ovate or elliptic, acuminate, rather rounded at base or subcordately contracted, 4.5 to 6×10 cm., palmately 5 or obscurely 7 nerved, the purple nerves glandular-granular below, glabrous; petiole short (10 mm.), not winged, often puberulent and glandular; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,631, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51104).

RANGE: Upper Reventazón Valley, Costa Rica.

9. Piper xanthoneurum Trel., sp. nov.

A glabrous shrub 3 meters tall; leaves elliptic, subrhombically inequilateral above the middle, acuminate, acute at base, 6 to 8×13 to 15 cm., palmately 5 or obscurely 7 nerved, minutely pale-punctulate beneath with the pale veins more or less moniliformly granular; petiole 10 to 15 mm. long, not winged; spikes (very young) 1×10 mm.; bracts concave, ciliate.

Type in the U. S. National Herbarium, no. 1,229,384, collected on the Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924, by Paul C. Standley (no. 35505).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Turrialba, ? *Tonduz* 4111; *Cook & Doyle* 369.

10. Piper venulosum Trel., sp. nov.

A glabrous shrub 2 to 4 meters tall; leaves broadly lanceolate, attenuate rather than acuminate, subequilaterally acute at base, 4 to 6×11 to 13 cm., palmately 5 or 7 nerved, venulose; petiole 10 to 15 mm. long, not winged; spikes 3×60 to 90 mm. or more; peduncle filiform, 15 to 20 mm. long; bracts concave, glabrate; berries small, oblong, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 716,432, collected near San Ramón, Costa Rica, by A. M. Brenes (no. 14192).

RANGE: Pacific slope of central Costa Rica.

COSTA RICA: Tilarán, *Standley & Valerio* 45702. Peña Blanca, ? *Pittier* 11949. Buenos Aires, ? *Tonduz* 4901.

11. Piper recuperatum Trel., sp. nov.

Piper medium Auct., as to Costa Rica.

A puberulent shrub; leaves broadly ovate, mucronately acuminate, rounded at base or subtruncate with a deltoid contraction into the petiole, palmately 7 nerved; petiole 8 to 15 mm. long, not winged; spikes 4×60 to 70 mm.; peduncle slender, 10 to 15 mm. long; bracts concave, ciliolate; berries small, ovoid, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 796,471, collected in forests of Santo Domingo de Golfo Dulce, Costa Rica, March, 1896, by A. Tonduz (no. 9927; distributed also as J. D. Smith no. 7134).

RANGE: Lowlands of southwestern Costa Rica.

12. Piper nicoyanum C. DC. Bot. Gaz. 70: 174. 1920.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13689, the type).

RANGE: Lowlands of northwestern Costa Rica.

COSTA RICA: Nicoya, *Tonduz* 13695, 13696. Las Huacas, Nicoya Peninsula, *Cook & Doyle* 735. El Arenal, *Valerio* 131. Capulín, Río Grande de Tárcoles, *Standley* 40190.

13. Piper dissimulans Trel., sp. nov.

Piper papantlense Auct., as to Costa Rica.

Piper plantagineum Auct., as to Costa Rica.

A glabrous shrub; leaves acuminate, subelliptic and rounded or subacute at base, or the lower leaves broadly ovate and cordate, 5×10 to 8 or 12×16 cm., palmately 7 or 9 nerved; petiole 10 to 15 mm. long and unwinged, or on the lower leaves 20 to 35 mm. long and winged to or beyond the middle; spikes 2 (or in fruit 5) ×80 to 150 mm.; peduncle very slender, 15 to 20 mm. long; bracts rounded-subpeltate, ciliate; berries small, subglobose-oblong, glabrous; stigmas 2 to 4, minute, sessile.

Type in the U. S. National Herbarium, no. 798,447, collected in forests of Las Vueltas, Tucurrique, Costa Rica, altitude 635 meters, November, 1898, by A. Tonduz (no. 12773).

RANGE: Caribbean slope of central Costa Rica.

COSTA RICA: Pejivalle, Cartago, *Standley & Valerio* 46718. Las Pavas, Reventazón, *Pittier* 3186. Juan Viñas, *Cook & Doyle* 311. Gloria de Juan Viñas, *Pittier* 3659. Río Tuis, *Tonduz* 8168. Turrialba, *Tonduz* 2110, 4110, 8290.

14. Piper smilacifolium H. B. K. Nov. Gen. & Sp. 1: 56. 1815.

Enckea smilacifolia Kunth, Linnaea 13: 605. 1839.

Piper discophorum C. DC. Bull. Soc. Bot. Belg. 30[1]: 201. 1891.

TYPE LOCALITY: Caripe, Venezuela.

RANGE: Northern South America to Guatemala, at low altitudes.

COSTA RICA: Surubres, San Mateo (*Biolley* 4047, type of *P. discophorum*). Capulín, Río Grande de Tárcoles, *Standley* 40118, 40143. Matambú, Nicoya Peninsula, *Cook & Doyle* 695. Nicoya, *Tonduz* 13965. Punta Mala, *Tonduz* 6789. Tilarán, *Standley & Valerio* 44189. Hacienda de Guácimo, *Tonduz* 14660. La Palma, *Tonduz* 6733. Puerto Viejo and Sarapiquí River, *Biolley* 6915. Shirores, *Tonduz* 9275. Zhorquín, *Tonduz* 8556, 8594. Finca Montecristo, *Standley & Valerio* 48553. Limón, *Stevens* 850. Río Corozal, *Tonduz* 7142, 9981. Sipurio, *Tonduz* 8705.

15. Piper san-joseanum C. DC. Linnaea 37: 351. 1872.

Piper marginatum Auct., as to Costa Rica.

TYPE LOCALITY: Mount Aguacate, near San José, Costa Rica (*Oersted* 893, the type).

RANGE: Central Costa Rica on the Pacific slope, and Panama.

COSTA RICA: Mount Aguacate, *Oersted* 869, 892, 894. San Juan, Río Virilla, *Tonduz* 12728. Llanos de Turrúcares, *Pittier* 501. Boruca, *Tonduz* 4481, 4661. Rodeo de Pacaca, *Pittier* 1593, 3320, "3820." Carmona, Río Nandayuri, *Jiménez* 393. Escasú, *Standley* 32346. El Bolsón, Guanacaste, *Pittier* 2610. Líbano, *Standley & Valerio* 44924. Tilarán, *Standley & Valerio* 44249, 45706. Los Conventillos, Salinas Bay, *Tonduz* 2875.

15a. Piper san-joseanum minor Trel., var. nov.

Smaller, with leaves 6.5×10 cm.

Type in the U. S. National Herbarium, no. 577,927, collected at Nicoya, Costa Rica, by A. Tonduz (no. 13695).

RANGE: Pacific lowlands of Costa Rica.

16. Piper tuberculatum minus C. DC. in DC. Prodr. 16[1]: 266. 1869.

TYPE LOCALITY: Santa Marta, Colombia (*Balbis*).

RANGE: Colombia to Guatemala.

COSTA RICA: Without locality, *Hoffmann* 749. Aguacaliente, *Oersted* 897. Alajuela, *Smith* 6747. Cartago, *Oersted* 898. San José, *Tonduz* 7306. Surubres, San Mateo, *Biolley* 7051. Sabana de las Chiquizás, *Pittier* 2958 Capulín, Río Grande de Tárcoles, *Standley* 40169. Boca Culebra, *Pittier* 12081. Salinas Bay, *Pittier* 2925. Nicoya, *Tonduz* 13693. Bebedero, Guanacaste, *Standley & Valerio* 46680. Tilarán, *Standley & Valerio* 46568. Colonia Carmona, *Jiménez* 363.

17. Piper corozalanum Trel., sp. nov.

Piper geniculatum Auct., as to Costa Rica.

A glabrous or obscurely hirtellous shrub; leaves broadly subovate-elliptic abruptly short-acuminate, rounded at base and shorter on one side, 9 to 11×17 to 21 cm., pinnately nerved throughout, the nerves about 12×2; petiole scarcely 2+8 mm., winged to the end; spikes 2 to 3×120 to 140 mm.; peduncle 15 mm. long; bracts sublunulate; berries depressed, quadrately elongate with the rachis; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 796,338, collected along the Río Corozal, near Santo Domingo de Golfo Dulce, Costa Rica, April, 1896, by A. Tonduz (no. 10001; distributed also as J. D. Smith no. 7130).

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Santo Domingo de Golfo Dulce, *Tonduz* 9895; distributed also as J. D. Smith 7146. Boca Zacate, Punta Mala, *Tonduz* 6824. Los Ayotes, Tilarán, *Standley & Valerio* 45571. La Tejona, Tilarán, *Standley & Valerio* 45934.

18. Piper obumbratifolium Trel., sp. nov.

A shrub, slightly puberulent on the axes and on the nerves beneath: leaves subovate-oblong or elliptic, gradually pointed rather than acuminate, unequally rounded at base or subcordulate on the shorter side, 10 to 15×27 to 30 cm., pinnately nerved nearly to the end, the nerves about 12×2; petiole 5+15 mm., winged to the end; spikes (very young) 2×13 mm., mucronate; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,309 (also as no. 1,307,308), collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44387).

RANGE: Pacific slope of Costa Rica.

19. Piper pseudobumbratum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 171. 1897.

TYPE LOCALITY: El Muelle, Río Sarapiquí, Costa Rica (*Biolley* 7438, the type).

RANGE: Caribbean slope of Costa Rica.

20. Piper longepetiolatum (C. DC.) Trel.

Piper geniculatum longepetiolatum C. DC. Bull. Soc. Bot. Belg. 30 [1]: 201. 1891.

TYPE LOCALITY: El General, Costa Rica (*Tonduz* 3384, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Los Palmares, *Tonduz* 3391.

21. Piper sublineatum Kuntze, Rev. Gen. **2**: 565. 1891.

Piper biolleyi C. DC. Bull. Soc. Bot. Belg. 30 [1]: 210. 1891.

TYPE LOCALITY: Angostura, Costa Rica (*Kuntze*).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: La Colombiana Farm, *Standley* ? 36679. Carrillo Road (*Tonduz* 2529, type of *P. biolleyi*). Chilamate, *Biolley* 7442. Santa Clara, Las Delicias, *Biolley* 10673. Tsaki, *Tonduz* 9528. Tuis, *Tonduz* 8161, 11526. Shirores, *Tonduz* 9278. Turrialba, *Smith* 4938; *Tonduz* 8385. Juan Viñas, *Cook & Doyle* 257, 289. El Muñeco, *Standley* 33671, 33677; *Standley & Valerio* 51045. Pejivalle, *Standley & Valerio* 46733. Peralta, *Stevens* 413, 535b.—Also, possibly

separable, from the Pacific slope: El General, *Tonduz* 3396. Cabeceras del Diquís, *Pittier* 10598. El Arenal, *Standley & Valerio* 45054, 45159, 45233. Los Ayotes, *Standley & Valerio* 45476. Tilarán, *Standley & Valerio* 44334.

22. **Piper brenesii** C. DC. Bot. Gaz. 70: 180. 1920.

TYPE LOCALITY: San Ramón, Costa Rica (*Brenes* 14190, the type).

RANGE: Pacific slope of Costa Rica.

23. **Piper seductum** Trel., sp. nov.

A glabrous shrub; leaves lanceolate, falcately acuminate, rounded at base, 4.5 to 6×13 to 15 cm., pinnately nerved from the lower half, the longer impressed nerves about 4×2, with shorter nerves upward, chartaceous; petiole scarcely 10 mm. long, winged on the lower leaves; spikes 3×60 to 70 mm.; peduncle 5 mm. long; berries triquetrous; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,210, collected at Madre de Dios, Costa Rica, altitude 50 meters, October, 1896, by H. Pittier (no. 10308).

RANGE: Caribbean lowlands of Costa Rica.

24. **Piper asymmetricum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 172. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7661, the type).

RANGE: Caribbean border of Costa Rica and Nicaragua.

25. **Piper borucanum** C. DC. Bull. Soc. Bot. Belg. 30[1]: 219. 1891.

TYPE LOCALITY: Boruca, Costa Rica (*Tonduz* 3609, the type).

RANGE: Diquís Valley, Costa Rica.

COSTA RICA: Boruca, *Pittier* 4485. San Ramón, *Tonduz* 17778. Buenos Aires, *Pittier* 4899. Golfo Dulce, ?*Pittier* 9915.

26. **Piper prismaticum** C. DC. Linnaea 37: 342. 1872.

Piper turrialvanum C. DC. Linnaea 37: 342. 1872.

TYPE LOCALITY: Turrialba, Costa Rica (*Oersted* 886, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Turrialba (*Oersted* 901, type of *P. turrialvanum*). Pejivalle, *Standley & Valerio* 46764. La Hondura, *Standley* 36145, 37880; *Standley & Valerio* 51835.

26a. **Piper prismaticum magnifolium** (C. DC.) Trel.

Piper turrialvanum magnifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7642, the type).

RANGE: Caribbean slope of northeastern Costa Rica.

COSTA RICA: Río Naranjo, *Tonduz* 7653. Guápiles, *Standley* 37154. Alto del Pito, *Tonduz* 7707. Trejos, Las Vueltas, Tucurrique, *Tonduz* 12857 (at Leningrad—the very long spike 10 mm. thick).

26b. **Piper prismaticum tilaranum** Trel., var. nov.

Leaves more elongate than in the type, and sublanceolate.

Type in the U. S. National Herbarium, no. 1,307,400, collected at La Tejona, north of Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45767).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Tejona, *Standley & Valerio* 45763, 45832, 45889.

26c. **Piper prismaticum villosulum** Trel., var. nov.

Sparsely and transiently soft-hairy, even on the upper leaf-surface.

Type in the U. S. National Herbarium, no. 1,307,545, collected at Finca Montecristo, below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 48570).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48413, 48548. El Muñeco, *Standley & Torres* 50971, 51234.

27. Piper arielanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.

TYPE LOCALITY: Valley of La Estrella, Río Ariel, Talamanca, Costa Rica (*Tonduz* 9387, the type).

RANGE: Caribbean slope of Costa Rica.

28. Piper cyanophyllum Trel., sp. nov.

A small shrub, glabrous, or with subpuberulent twigs; leaves elliptic-ovate, bluntly subacuminate, rounded or the upper acutish at base, 2×8 to 5×10 cm., pinnately nerved nearly throughout, the nerves 8 or 10×2, slightly granular; petiole 5 mm. long, or on the lowest leaves 25 mm. long and winged to or beyond the middle; spikes (very young) as yet scarcely 1×4 mm., on an equilong filiform peduncle.

Type in the Candollean Herbarium, Geneva, collected along the Río Naranjo, Costa Rica, by A. Tonduz (no. 7576).

RANGE: Caribbean lowlands of Costa Rica.

29. Piper guanacastense C. DC. Linnaea 37: 356. 1872.

Piper trinerve Auct., as to Costa Rica.

TYPE LOCALITY: Guanacaste, Costa Rica (*Oersted* 862, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Guanacaste, *Oersted* 863. Colonia Carmona, Guanacaste, *Jiménez* 362. Térraba, *Tonduz* 3599. Santo Domingo de Golfo Dulce, *Tonduz* 10021 (J. D. Smith 7128). Boruca, *Pittier* 4663, 4781; *Tonduz* 3597, 3606. Punta Mala, *Tonduz* 6788. Surubres, San Mateo, *Biolley* 7053. Buenos Aires, *Pittier* 4890. Palmar, *Pittier* 6748. Los Ayotes, Tilarán, *Standley & Valerio* 45478. Nicoya, *Tonduz* 13690. Matambú, *Cook & Doyle* 704.

30. Piper acuminatissimum C. DC. Bot. Gaz. 70: 189. 1920.

TYPE LOCALITY: San Carlos, Costa Rica (*Pittier* 16321, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: San Carlos, *Koschny* in 1901.

31. Piper urostachyum Hemsl. Biol. Centr. Amer. 3: 57; 5: *pl.* 72. 1882.

Piper lanuginosum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

TYPE LOCALITY: Chontales, Nicaragua (*Tate* 319, the type).

RANGE: Caribbean region of Nicaragua and contiguous Costa Rica.

COSTA RICA: Boca Machado, San Juan Valley, *Pittier* 9636. Río Naranjo, *Tonduz* 7519 (type of *P. lanuginosum*). Limón, *Cook & Doyle* 432. La Colombiana Farm, *Stevens* 595; *Standley* 36960. Finca Montecristo, *Standley & Valerio* 48586. Guápiles, *Standley* 37209, 37284. Shirores, *Pittier & Tonduz* 9261. Río Tuis, *Tonduz* 8170.

32. Piper arcte-acuminatum Trel., sp. nov.

A small assurgent shrub, sparingly long-villous nearly throughout; leaves round-ovate, abruptly long-slender-acuminate, slightly inequilaterally shallow-cordate, 10 to 13×21 cm., submultiple-nerved from below about the middle, the nerves 7 or 8×2; petiole very short (5 mm.), sheathing below; spikes 3×70 mm. or more, scarcely caudate; peduncle filiform, 30 mm. long; bracts roundish-subpeltate, the pale margin ciliolate.

Type in the U. S. National Herbarium, no. 1,229,715, collected near Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March, 1924, by Paul C. Standley (no. 37115).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37093, 37230.

33. Piper irazuanum C. DC. Linnaea **37**: 340. 1872.

Piper pachystachyon Auct., as to Costa Rica.

TYPE LOCALITY: Volcán de Irazú, Costa Rica (*Oersted* 866, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Volcán de Irazú, *Brade* 2003; *Tonduz* 4245. Volcán de Barba, *Tonduz* 1330. Rancho Flores, *Tonduz* 2089. Río Poás, *Tonduz* 1708. Mount Candelaria, *Hoffmann* 856.

33a. Piper irazuanum suborbiculatum Trel., var. nov.

Conspicuously differing in its obtuse-based or even cordulate leaves ranging from round-ovate or elliptic and 12×17 cm., to elliptic-oblong and 6×13 cm., exceptionally soft-pubescent even above, the thick spikes 50 to 100 mm. long.

Type in the U. S. National Herbarium, no. 1,307,274, collected near Finca La Cima, above Los Lotes, north of El Copey, Province of San José, Costa Rica, altitude 2,100 to 2,400 meters, December, 1925, by Paul C. Standley (no. 42681).

RANGE: Central mountains of Costa Rica.

COSTA RICA: El Copey, *Tonduz* 11904. Laguna de la Escuadra, El Copey, *Standley* 41951. San José, *Pittier* 4245. Las Nubes, *Standley* 38527, 38574, 38764. La Esperanza, Volcán de Irazú, *Standley* 35384.

34. Piper candelarianum C. DC. Linnaea **37**: 357. 1872.

Piper globosum C. DC. Linnaea **37**: 357. 1872, not Poir.

Piper psilocladum C. DC. Bull. Soc. Bot. Belg. **30**[1]: 211. 1891.

Piper phthinotrichon Auct., as to Costa Rica.

Piper lanceolatum Auct., as to Costa Rica.

TYPE LOCALITY: Mount Candelaria, near San José, Costa Rica (*Oersted* 828, the type).

RANGE: Through Costa Rica in differing but scarcely definable forms.

COSTA RICA: Mount Candelaria, *Oersted* 861 (type of *P. globosum* C. DC.). Cabagra, *Pittier* 6532. Carrillo Road, *Biolley* 3180 (type of *P. psilocladum*). El Muñeco, Río Navarro, *Standley* 33569, 33953; *Standley & Valerio* 50902, ?51112, 51263. Navarrito, *Lankester* 740. Orosi, *Standley* 39853. Río Reventado, *Cooper* 379 (J. D. Smith 5916). San Blas de Tarrazú, *Jiménez* 1093. Santa María de Dota, *Tonduz* 2273; *Standley* 41744, 41865, 42837; *Standley & Valerio* 43333, 44075. Tuis, *Tonduz* 8174, 11521. Las Vueltas, *Tonduz* 12736. El Arenal, *Standley & Valerio* 45157, 45207. Naranjos Agrios, *Standley & Valerio* 46464, 46529. La Tejona, *Standley & Valerio* 45838. Tilarán, *Standley & Valerio* 46646. Boruca, *Tonduz* 4108. Golfito, *Pittier* 9911.

34a. Piper candelarianum angustatum Trel.

Piper sepium glabrum C. DC. Bot. Gaz. **70**: 179. 1920; not *P. glabrum* Mill.

TYPE LOCALITY: Upper Diquís Valley, Costa Rica (*Pittier* 10570, the type).

RANGE: Upper Pacific slope of Costa Rica.

COSTA RICA: La Palma, *Tonduz* 6755.

34b. Piper candelarianum latifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 167. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River, Costa Rica (*Biolley* 7439, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Río Zhorquín, *Torduz* 8525. Hamburg Finca, *Standley & Valerio* 48668.

34c. Piper candelarianum sepium (C. DC.) Trel.

Piper sepium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 168. 1897.

TYPE LOCALITY: Turrialba, Costa Rica (*Tonduz* 8345, the type).

RANGE: Costa Rica.

COSTA RICA: El Coyolar, Alajuela, *Standley* 39980, 40015.

35. Piper artanthopse C. DC. Journ. Bot. Brit. & For. 4: 161. 1866.

Piper oerstedii C. DC. Linnaea 37: 359. 1872.

TYPE LOCALITY: Mount Aguacate, Costa Rica (*Hoffmann* 687, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Mount Aguacate, *Hoffmann* 776. Without locality, *Oersted* 884 (type of *P. oerstedii*). About San Ramón, *Brenes* 14188, 14512, 17767.

36. Piper curtispicum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7522, the type).

RANGE: Caribbean lowlands of Nicaragua and Costa Rica.

COSTA RICA: With the type, *Tonduz* 7539 in part.

37. Piper ripicola C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 171. 1897.

TYPE LOCALITY: Río Coto, Golfo Dulce, Costa Rica (*Pittier* 9988, the type; distributed also as J. D. Smith 7143).

RANGE: Pacific lowlands of southern Costa Rica.

38. Piper pubinerve C. DC. Bot. Gaz. 70: 172. 1920.

TYPE LOCALITY: El General, Costa Rica (*Pittier* 10607, the type).

RANGE: Upper Diquís Valley, Pacific slope of Costa Rica.

39. Piper cuspidispicum Trel., sp. nov.

Piper singulare Auct., as to Costa Rica.

A shrub, glabrous except for the nerves, these puberulent beneath; leaves broadly ovate, acuminate, rounded at base, 9 to 10×14 to 15 cm., or 13×16 cm., multiple-nerved from below the middle, the nerves 4 or 5×2; petiole 20 to 30 mm. long (or 50 mm. in the rounder leaves), winged; spikes 10×20 mm., filiformly caudate; peduncle 10 mm. long; bracts lunulate, glabrate; stigmas 2, thick, on an elongate style.

Type in the U. S. National Herbarium, no. 1,229,390, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924, by Paul C. Standley (no. 35642).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: La Carpintera, *Standley* 35671, 35701; *Pittier* 125. Yerba Buena, Heredia, *Standley & Valerio* 49950, with larger leaves.

40. Piper viridispicum Trel., sp. nov.

A small shrub, sparsely crisp-villous throughout; leaves obliquely subelliptic-ovate or obovate, short-acuminate, inequilateral at base with one side subacute, 12×21 cm. or the lower much reduced, pinnately nerved from below the middle, the nerves about 4×2; petiole 5+5 to 10+3 mm. long, winged; spikes 6×20 mm., green; berries subglobose; stigmas 3, thick, on a stout style.

Type in the U. S. National Herbarium, no. 1,307,534, collected at Finca Montecristo, below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 48536).

RANGE: Lower Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* 48599.

41. Piper dryadum C. DC. Bull. Soc. Bot. Belg. 30[1]: 221. 1891.

TYPE LOCALITY: Siquirres, Costa Rica (*Pittier* 3193, the type).

RANGE: Pacific lowlands of Costa Rica.

42. Piper rufescens C. DC. Bull. Soc. Bot. Belg. 30[1]: 218. 1891.

Piper nemorense C. DC. Bull. Soc. Bot. Belg. 30[1]: 222. 1891.

Piper marequitense Auct., as to Costa Rica.

TYPE LOCALITY: Juan Viñas, Costa Rica (*Tonduz* 1850, the type).

RANGE: Central divide of Costa Rica.

COSTA RICA: Juan Viñas, *Tonduz* 1849 (type of *P. nemorense*); *Cook & Doyle* ?353. El Muñeco, Cartago, *Standley* 33473, 33584; *Standley & Valerio* 50942,

51109 with some leaves subcordate. La Hondura, *Standley* 36124, 38162 with subvillous pubescence. La Palma, *Tonduz* 12664. Without locality, *Kuntze* 2254. Las Cóncavas, *Lankester* K34.

43. Piper pachystylum Trel., sp. nov.

A glabrous, somewhat granular-punctulate shrub; leaves elliptic, subacuminate, slightly inequilaterally acute at base, 9×18 cm., submultiple-nerved from the lower half, the nerves 4×2; petiole 15 to 30 mm. long, somewhat winged; spikes 2 to 3×30 to 40 mm.; peduncle filiform, 10 mm. long; ovary obovoid with a short thick style.

Type in the Botanical Garden Herbarium, Brussels, collected at Palmar, Río Grande de Térraba, Costa Rica, by H. Pittier and A. Tonduz (no. 6717).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Cabagra, near Buenos Aires, *Pittier* 6534.

44. Piper viridifolium Trel., sp. nov.

A shrub, hirtellous on the nerves beneath and occasionally below the petioles; leaves elliptic, short-acuminate, the narrowed base rounded or subcordulate, 8×16 to 12×22 cm., pinnately nerved from below the middle, the nerves 6×2, dark green above, paler beneath; petiole 10 to 20 mm. long, winged; spikes 6×40 mm.; peduncle slender, 20 mm. long; bracts concave-inflexed; berries depressed, somewhat elongate with the rachis; stigmas 2 or 3, short, on an elongate style.

Type in the U. S. National Herbarium, no. 1,307,622, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March, 1926, by Paul C. Standley and Juvenal Valerio (no. 51034).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: El Muñeco, *Standley & Valerio* 51056. Cartago, *Standley & Valerio* 47109.

45. Piper annulatum Trel., sp. nov.

A shrub; leaves elliptic-ovate, acuminate, acute at base, 12×22 cm., subpinnately nerved from below the middle, the nerves 5×2 with the lowermost basal, sparsely white-villous on the nerves beneath; petiole 20 mm. long, transiently subvillous, winged; spikes 4×95 mm., subannularly flowered; peduncle thick, 10 mm. long, transiently subtomentose-villous; bracts triangular-subpeltate, pale-margined, fimbriate; berries ellipsoid, slightly elongate with the rachis; stigmas 3, recurving, on a short style.

Type in the U. S. National Herbarium, no. 1,229,383, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,800 meters, February, 1924, by Paul C. Standley (no. 35500).

RANGE: High divide of central Costa Rica.

46. Piper pseudopropinquum C. DC. Linnaea 37: 341. 1872.

TYPE LOCALITY: Turrialba, Costa Rica (*Oersted* 820, the type).

RANGE: Divide of central Costa Rica.

COSTA RICA: Páramo de Abejonal, *Tonduz* 7789. Los Frailes, *Tonduz* 7875. Alajuelita, *Tonduz* 1472. Santa María de Dota, *Standley* 41745, 41802, 42537; *Standley & Valerio* 43279, 43280, 43332.

47. Piper labeculatum Trel., sp. nov.

A glabrous black-punctulate herb; leaves elliptic or the lower ovate, short-acuminate, subequally rounded at base or very abruptly subacute, 8 to 11×16 cm., pinnately nerved from below the middle or somewhat higher, the nerves about 5×2; petiole 10 to 25 or even 45 mm. long, winged to beyond the middle; spikes (still very young) 2×15 or 3×60 mm., mucronate, on a short peduncle.

Type in the U. S. National Herbarium, no. 1,307,343, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45053).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Silencio, Guanacaste, *Standley & Valerio* 44656. Tilarán, ? *Standley & Valerio* 44361. El Arenal, *Standley & Valerio* 45211.

48. Piper submultiplinerve C. DC. Bot. Gaz. 70: 184. 1920.

TYPE LOCALITY: Valley of Los Arcángelos, Volcán de Irazú, Costa Rica (*Pittier* 13626, the type; "13062").

RANGE: Volcanic mountains of central Costa Rica.

COSTA RICA: San Pablo de Tarrazú, *Jiménez* 1091.

49. Piper nudifolium C. DC. Bull. Soc. Bot. Belg. 30[1]: 205. 1891.

TYPE LOCALITY: Río Grande de Térraba, Costa Rica (*Pittier* 3613, the type).

RANGE: Diquís Valley, Pacific slope of Costa Rica.

COSTA RICA: Palmares, Río Grande de Térraba, *Pittier* 3663, 6717, ?12664. Río Hacúm, Buenos Aires, *Pittier* 4891. Río Hur, *Pittier* 11971.

50. Piper chirripoense C. DC. Bot. Gaz. 70: 186. 1920.

TYPE LOCALITY: Chirripó, Costa Rica, at 100 meters (*Pittier* 16061, the type).

RANGE: Caribbean lowlands of Costa Rica.

51. Piper calcaratum C. DC. Bot. Gaz. 70: 188. 1920.

Piper calcaratum C. DC.; Urban, Symb. Ant. 7: 182. 1912, name only.

TYPE LOCALITY: Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13185, the type).

RANGE: Reventazón Valley, Costa Rica.

52. Piper jubatum Trel., sp. nov.

A shrub, crisp-hairy on the petioles and the stem below; leaves elliptic, short-acuminate, the narrowed base slightly inequilaterally cordulate, 6 to 9.5×15 to 17 cm., pinnately nerved from below the upper third, the nerves 6 or 7×2 and appressed-pubescent beneath; petiole 10 to 15 mm. long, winged; spikes 3×60 mm., sterile upward, drying green; peduncle 10 mm. long, obscurely velvety; bracts concave-incurved; berries rather large, subglobose; stigmas 3, short, on a rather short style.

Type in the U. S. National Herbarium, no. 1,229,419, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March, 1924, by Paul C. Standley (no. 36812).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: With the type, *Standley* 36779, 36858. Guápiles, *Standley* ?37032, 37124, 37216, 37322.

53. Piper altevaginans Trel., sp. nov.

A shrub, crisp-puberulent on the nerves beneath and the petioles, and the stem below them striately crisp-pubescent; leaves elliptic, gradually acute, or short-acuminate, small for the group (3.5 to 5.5×8 to 12 cm.), pinnately nerved from below the upper third, the nerves 5 or 6×2, granular beneath between the nerves; petiole 3 to 10 or 15 mm. long, winged to the end; spikes scarcely 3×30 mm., blunt-mucronate; peduncle 10 mm. long, crisp-pubescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,438, collected near Guápiles, Province of Limon, Costa Rica, altitude 300 to 500 meters, March, 1924, by Paul C. Standley (no. 37316).

RANGE: Caribbean piedmont of central Costa Rica.

54. Piper pexum Trel., sp. nov.

A shrub, subvillous-hirsute on the axes and on the nerves beneath; leaves lance-elliptic or ovate, subfalcately acuminate, obliquely cordulate, 5.5 to 7×14

to 15 cm., pinnately nerved from below the middle, the nerves some 5+4; petiole 5+2 to 15 mm. long, winged to the middle; spikes 5×95 mm., submucronate; peduncle 10 to 15 mm. long; bracts triangular-subpeltate, ciliate; berries subglobose; stigmas 3, short, on a very short style.

Type in the U. S. National Herbarium, no. 1,307,264, collected along Río Blanco, near El Copey, Province of San José, Costa Rica, altitude 1,800 to 1,900 meters, December 16, 1925, by Paul C. Standley (no. 41887).

RANGE: Central divide of Costa Rica.

55. **Piper operosum** Trel., sp. nov.

A shrub, glabrous except for a hirsute line on the back of the petioles and the stem below, and the appressed-pubescent nerves beneath; leaves elliptic, subacuminate, the somewhat oblique, narrowed base slightly cordulate, 5.5 to 7.5×14 to 16 cm., pinnately nerved from below the upper third, the nerves about 6×2; petiole some 13+2 mm., winged; spikes 3×40 mm., with slender sterile tip; peduncle 5 to 10 mm. long; bracts lunulately inflexed; stigmas 2, on a conical style.

Type in the U. S. National Herbarium, no. 1,307,491, collected near Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 47135).

RANGE: Upper Reventazón Valley, Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* 46758.

56. **Piper subsericeum** Trel., sp. nov.

A shrub, sparsely short-silky on the axes and the nerves of the leaves; leaves lance-ovate, long-acuminate, slightly oblique-rounded at base, pinnately nerved from below the middle, the nerves some 6+5; petiole 10 mm. long, winged; spikes as yet very young and minute, submucronate.

Type in the U. S. National Herbarium, no. 1,307,551, collected at Finca Montecristo, below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 48636).

RANGE: Caribbean lowlands of Costa Rica.

57. **Piper zhorquinense** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

Piper submarginense C. DC. in Donn. Smith, Enum. Pl. Guat. 6: 39. 1903 name only.

TYPE LOCALITY: Río Zhorquín, Costa Rica (*Tonduz* 8523, the type).

RANGE: Lower Caribbean slope of Costa Rica.

COSTA RICA: With the type, *Tonduz* 6635, "8543," 8548, 8585. Tsaki, *Pittier* 9531. Shirores, *Tonduz* 9262, 9263, 9273. Río Ariei, *Tonduz* 9381, 9382. Las Vueltas, *Tonduz* 13185bis (distributed also as J. D. Smith 7563; type of *P. submarginense*). Trejos, Tucurrique, *Tonduz* 12868. Carrillo Road, ?*Tonduz* 2523.

58. **Piper detonsum** Trel., sp. nov.

A shrub, somewhat crisp-hirtellous on the axes and petioles, and on the nerves beneath; leaves elliptic-sublanceolate, acuminate, nearly equilaterally subacute at base, 5.5 to 7×17 cm., pinnately nerved from below the upper third, the pale nerves about 6×2; petiole 10 to 15 mm. long, winged; spikes 3×30 to 50 mm., pointed; peduncle 10 to 15 mm. long; bracts concave-inflexed; berries subglobose or depressed-ellipsoid; stigmas 2, on a deciduous style.

Type in the U. S. National Herbarium, no. 1,307,305, collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44314).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Tilarán and vicinity, *Standley & Valerio* 44451, 44601, 44650a, 44656 in part, 44765, 44895, 45156, 45180, 45354, 45375, 45424, 45515, 45540, 45765, 45877, 45896, 45898, 46186, 46189, 46483, 46484, 46538.

59. Piper impube Trel., sp. nov.

A small glabrous shrub; leaves oblong, subacute at both ends, 3 to 4×10 to 14 cm., pinnately nerved from below the middle, the nerves about 4×2; petiole 1 cm. long, winged; spikes (young) 3×8 mm., caudate, on a slender equilong peduncle; bracts concave-inflexed.

Type in the U. S. National Herbarium, no. 1,307,457, collected at Naranjos Agrios, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 29, 1926, by Paul C. Standley and Juvenal Valerio (no. 46494).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Quebrada Serena, Tilarán, *Standley & Valerio* 46153, 46224, 46235.

60. Piper figlinum Trel., sp. nov.

A shrub, crisp-villous on and below the petioles, and toward the base of the leaves beneath; leaves long-lanceolate, gradually pointed, somewhat inequilaterally obtuse at base, 4.5 to 5×12 to 17 cm., pinnately nerved from below the middle, the nerves about 5×2; petiole 10 to 20 mm. long, winged; spikes (very young) 2×20 mm., with filiform apex, drying red.

Type in the U. S. National Herbarium, no. 1,307,280, collected near Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 43112).

RANGE: High divide of central Costa Rica.

61. Piper tarrazuense Trel., sp. nov.

A shrub, glabrous except for the transiently crisp-pubescent petioles and twigs below and the puberulent nerves beneath; leaves lanceolate, acuminate, slightly inequalateral at base with at least the longer side rounded, 4.5 to 5×15 cm., glandular-granular beneath, pinnately nerved from below the middle, the nerves 4×2; spikes slender and elongate; peduncle 15 mm. long; bracts concave-inflexed; berries depressed-ellipsoid; stigmas 3, on a tapering style.

Type in the U. S. National Herbarium, no. 1,080,654, collected at San Pablo de Tarrazú, Costa Rica, by Otón Jiménez (no. 1095).

RANGE: Mountains of central Costa Rica.

62. Piper subzhorquinense C. DC., sp. nov.

Piper subzhorquinense C. DC. in herb.

A shrub, sparsely subtomentulose on and below the petioles; leaves narrowly lanceolate, gradually subattenuate, the narrowed base obtuse, 4.5 to 6×17 to 20 cm., pinnately nerved from below about the upper fourth, the nerves about 6×2, sparsely crisp-pubescent on the nerves beneath; petiole 5 to 10 mm. long, winged to above the middle; spikes 3×25 to 40 mm., with a glabrate filiform sterile tip 3 to 10 mm. long; peduncle filiform, 10 mm. long; ovary glabrate; stigmas 3, on an evident style.

Type in the U. S. National Herbarium, no. 577,384, collected at Cañas Gordas, Costa Rica, altitude 1,100 meters, February, 1897, by H. Pittier (no. 11029).

RANGE: Southeastern Costa Rica.

COSTA RICA: With the type, ? *Pittier* 11024, 11030.

63. Piper ripense C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 169. 1897.

TYPE LOCALITY: Puerto Viejo, Costa Rica (*Biolley* 7444, the type).

RANGE: Caribbean piedmont of Costa Rica.

64. Piper sinugaudens C. DC. Bot. Gaz. **70**: 188. 1920.

TYPE LOCALITY: Buena Vista, Costa Rica (*Cook & Doyle* 150, the type).

RANGE: Santa Clara piedmont, Caribbean slope of Costa Rica.

65. **Piper calvirameum** C. DC. Bull. Soc. Bot. Belg. 30[1]: 200. 1891.

TYPE LOCALITY: Carrillo Road, Costa Rica (*Biolley* 3182, the type).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Aragón, *Pittier* 13235. Guápiles, *Standley* 37191, 37068, 37079. Finca Montecristo, *Standley & Valerio* 48563. Trejos, Las Vueltas, ? *Tonduz* 12868. Santa Clara, Las Delicias, *Biolley* 10672, 10674, 10677. Tuis, *Tonduz* 11520. Río Naranjo, *Tonduz* 7552.

66. **Piper brevistylum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 158. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River, Costa Rica (*Biolley* 7436, the type).

RANGE: Caribbean piedmont of Costa Rica.

67. **Piper orosianum** Trel., sp. nov.

A shrub, glabrous except for the obscurely and evanescently crisp-puberulent nodes, petioles, and nerves beneath; leaves lance-elliptic, gradually acuminate, nearly equilaterally acute at base, 5.5 to 6×16 to 18 cm., pinnately nerved from below about the middle, the nerves about 5×2, glossy green, drying rather papery; petiole scarcely 10+2 mm. long, winged to the middle; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,723, collected at Orosi, Province of Cartago, Costa Rica, March, 1924, by Paul C. Standley (no. 39764).

RANGE: Upper Reventazón Valley, Costa Rica.

68. **Piper arcessitum** Trel., sp. nov.

A shrub, glabrous except for the velvety nerves beneath; leaves narrowly elliptic, attenuate or acuminate with an abrupt filiform tip 2 to 5 mm. long, the narrowed base cordulate, 5 to 6.5×16 to 22 cm., pinnately nerved from below the middle, the nerves about 6×2; petiole 15 to 20 mm. long, winged; spikes 4×25 mm.; peduncle 5 mm. long; bracts concave-inflexed; stigmas 2 or 3 on a rather slender style.

Type in the U. S. National Herbarium, no. 1,307,650, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March, 1926, by Paul C. Standley and Rubén Torres (no. 51357).

RANGE: Upper Reventazón Valley, Carribean slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* 50949. Juan Viñas, *Tonduz* 1870.

69. **Piper coilostachyum** C. DC. Bull. Soc. Bot. Belg. 30[1]: 212. 1891.

TYPE LOCALITY: Valley of El General, Costa Rica (*Tonduz* 3382, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Tonduz* 3386, 3389, 3390. Without locality, *Pittier* 7539 in part. Madre de Dios, *Pittier* 6308.

70. **Piper tonduzii** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.
Piper nanum C. DC. Bot. Gaz. 70: 180. 1920.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Pittier* 9280, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 13186. Guápiles, *Standley* 37156, 37348. Pejivalle, *Standley & Valerio* 47077. Guácimo, *Tonduz* 14659, the type of *P. nanum*. La Colombiana Farm, *Standley* 36884. Finca Montecristo, *Standley & Valerio* 48436. Estrella, *Lankester* K85.

70a. **Piper tonduzii semiherbaceum** Trel., var. nov.

A low, spreading, dingy-villous half-shrub; leaves lanceolate, somewhat falcately subacuminate, obliquely cordulate, 4×12 cm., pinnately nerved from below the upper third, the nerves 4 or 5×2, rugose, impressed-punctulate and

glabrate above; petiole scarcely 8+2 mm. long, winged below; spikes 4×40 mm.; peduncle 5 to 7 mm. long; bracts lunulate-inflexed, ciliate; berries large, depressed, elongate with the rachis; stigmas 2, on a deciduous style.

Type in the U. S. National Herbarium, no. 1,307,443, collected at Quebrada Serena, near Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46261).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44751, 46160, 46261.

71. **Piper pallidifolium** C. DC. Bot. Gaz. 70: 176. 1920.

TYPE LOCALITY: Banks of the Río Ariei, Costa Rica (*Pittier* 9392, the type).

RANGE: Caribbean lowlands of Costa Rica.

72. **Piper aereum** Trel., sp. nov.

A glabrous shrub; leaves lance-oblong, gradually acute, obliquely rounded or subtruncate at base, 3 to 6×10 to 15 cm., submultiple-nerved from below the middle, with 3 or 4 nerves on each side, bronzing beneath; petiole 15 to 30 mm. long, winged; spikes 4×120 mm.; peduncle 15 mm. long; bracts lunulate-incurved, glabrous; ovary slightly pointed.

Type in the U. S. National Herbarium, no. 1,229,481, collected near Orosi, Province of Cartago, Costa Rica, March 30, 1924, by Paul C. Standley (no. 39842).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, Río Navarro, *Standley* 33650; *Standley & Valerio* 50891, 50970, 51205, 51210; *Standley & Torres* 51379.

73. **Piper deflexispicum** Trel., sp. nov.

A subvelvety shrub; leaves ovate, subacuminate, obliquely truncate-subcordulate or equilaterally rounded at base, 7 to 9×14 to 18 cm., submultiple-nerved with 2 upcurved nerves on each side from the lower half and 2 or 3 from the base, the nerves subvillous beneath toward the base; petiole 20 to 45 mm. long, winged; spikes pendent, 5×120 to 140 mm.; peduncle filiform, 20 to 25 mm. long; bracts quadrately subpeltate, fimbriulate; berries obovoid, pointed; stigmas 3, filiform, subsessile.

Type in the U. S. National Herbarium, no. 1,307,512, collected at Viento Fresco, Province of Alajuela, Costa Rica, altitude 1,600 to 1,900 meters, February 13, 1926, by Paul C. Standley and Rubén Torres (no. 47764).

RANGE: High central divide of Costa Rica.

COSTA RICA: With the type, *Standley & Torres* 47779. About Fraijanes, *Standley & Torres* 47568, 47576, 47593. El Muñeco, Río Navarro, Cartago, ? *Standley & Torres* 51349. Cerros de Zurquí, Heredia, *Standley & Valerio* 50354. Yerba Buena, *Standley & Valerio* 49899, with bronzing leaves. Cerro de las Caricias, *Standley & Valerio* 51963, 52049. Orosi, *Standley* 39723.

74. **Piper escasuense** Trel., sp. nov.

A glabrous shrub; leaves ovate or elliptic-ovate, acuminate, equilaterally shallowly and openly cordate, 6 to 10×15 to 18 cm., submultiple-nerved from below the middle, the nerves 4 or 5×2, drying thin; petiole 25 to 45 mm. long, the longest winged to or beyond the middle; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,677, collected on Cerro de Piedra Blanca, above Escasú, Province of San José, Costa Rica, January 31, 1924, by Paul C. Standley (no. 32627).

RANGE: High central divide of Costa Rica.

75. **Piper tacamahaca** Trel., sp. nov.

A glabrous shrub; leaves lanceolate, subacuminate, and acute-based above, the lower ovate and cordate, 3.5×10, 5×13, or 8×15 cm., submultiple-nerved,

with 4 to 6×2 nerves from below the middle or upper third, drying firm and blue-green, or bronzing beneath; petiole 10 to 20 mm. long, not winged; spikes 2×60 mm.; peduncle 10 mm. long; bracts roundish-subpeltate, glabrous.

Type in the U. S. National Herbarium, no. 1,229,355, collected at La Ventolera, southern slope of Volcán de Poás, Costa Rica, altitude 1,700 meters, February, 1924, by Paul C. Standley (no. 34578a).

RANGE: Central mountains of Costa Rica.

COSTA RICA: With the type, *Standley* 34533, 34666, 34736. Cerro de la Carpintera, Cartago, *Standley* 35772. Volcán de Poás, ? *Pittier* 2958.

76. Piper subvariabile Trel., sp. nov.

A shrub, essentially glabrous; leaves lance- or elliptic-ovate, gradually pointed, subequilaterally shallowly cordate, 9 to 12×18 to 24 cm., submultiple-nerved from below the upper third, the nerves 4 or 5×2; petiole 20 to 25 mm. long, not winged; spikes 3×70 mm.; bracts inconspicuous, concave; berries minute, obpyramidally triquetrous; stigmas minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,334, collected near Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44970).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44294, 45401, 45682, 45798, 46492, 46610, 46644.

77. Piper caeruleifolium Trel., sp. nov.

A glabrous shrub; leaves ovate, acuminate, very slightly obliquely rounded at base, 3.5 to 6×9 to 13 cm., submultiple-nerved from below the upper third, the nerves 4 or 5×2, drying rather firm and bluish; petiole 10 mm. long, not winged; spikes 3.5×65 mm.; peduncle 10 mm. long; bracts inconspicuous, roundish-subpeltate, ciliate; berries oblong-triquetrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,425, collected at Quebrada Serena, near Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 46134).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Standley & Valerio* ?46111, 46234. Capulín, ? *Standley* 40152.

78. Piper corrugatum Kuntze, Rev. Gen. Pl. 2: 565. 1891.

Piper tsakianum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 174. 1897.

TYPE LOCALITY: Limón, Costa Rica (*Kuntze* 2022, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9532, the type of *P. tsakianum*. Tsuritkub, *Tonduz* 8612, 8721.

79. Piper gibbosum C. DC. Bull. Soc. Bot. Belg. 30[1]: 212. 1891.

TYPE LOCALITY: Rancho Flores, Pacific slope of Volcán de Barba, Costa Rica (*Tonduz* 2088, the type).

RANGE: Central mountains of Costa Rica.

80. Piper paulownifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 173. 1897.

Piper tiliaefolium paulownifolium C. DC. Candollea 1: 154. 1923.

TYPE LOCALITY: La Palma, Costa Rica (*Pittier* 6739, the type).

RANGE: Caribbean slope of Costa Rica; and, perhaps in a differentiable form, Panama.

COSTA RICA: Río de las Vueltas, *Tonduz* 12778, 12940. Río Tuis, *Pittier* 8122, 8165, 11268; *Tonduz* 11525 (J. D. Smith 7334). Río Ariei, *Pittier* 9393. Puerto Viejo and Sarapiquí River, *Biolley* 6916, 7441. Finca Montecristo, *Standley & Valerio* 48541, 48551, 48557. Río Naranjo, *Tonduz* 7627

81. Piper omega Trel., sp. nov.

A shrub, glabrous or the nerves puberulent beneath near the end; leaves ovate, acuminate, cordate, the larger with omega-shaped sinus, the margin connate across the petiole, 11×20 to 19×35 cm., multiple-nerved with 2 strong ascending nerves on each side from the lower half and 5 or 6 from the base, the nerves salient and pale beneath; petiole 40 to 90 mm. long, on the larger leaves winged below the middle; spikes (young) 3×80 mm.; peduncle 20 mm. long.

Type in the U. S. National Herbarium, no. 1,229,449, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March, 1924, by Paul C. Standley (no. 37800).

RANGE: Central Costa Rica.

COSTA RICA: With the type, *Standley* 36536. El Muñeco, Río Navarro, *Standley & Valerio* 50940. Peralta, *Stevens* 323, 370.

82. Piper carrilloanum C. DC. Bull. Soc. Bot. Belg. 30[1]: 209. 1891.

TYPE LOCALITY: Carrillo Road, Costa Rica (*Tonduz* 2525, the type).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Carrillo Road, *Tonduz* 2526.

83. Piper vallicolum C. DC. Bull. Soc. Bot. Belg. 30[1]: 222. 1891.

TYPE LOCALITY: Río Jaris, Pacaca, Costa Rica (*Pittier* 3298, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Pittier* 4892; *Tonduz* 4893. El Arenal, ? *Standley & Valerio* 45040, 45199. Punta Mala, *Tonduz* 6806, 6821. El General, *Tonduz* 3600. San Pablo de Tarrazú, ? *Jiménez* 1092.

84. Piper aragonense Trel., sp. nov.

Piper multiplinervium Auct., as to Costa Rica.

A scandent shrub, slightly puberulent on the axes, petiole, and lower side of the leaf; leaves ovate or round-ovate, abruptly acuminate, subtruncate at base, 6×9 to 10×15 cm., multiple-nerved, with 2 or 3 basal nerves and a branch from below the middle of the midrib, on each side; petiole 15 to 25 mm. long, winged to the blade; spikes 2×100 to 150 mm.; peduncle 15 mm. long; bracts rounded-subpeltate; berries minute, subglobose, glabrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 796,497, collected at Aragón, near Turrialba, Costa Rica, altitude 700 meters, October 20, 1894, by A. Tonduz (no. 9021).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Turrialba, *Pittier* 9022. Tsuritkub, *Tonduz* 8681. Without locality, "*Tonduz* 8866." Carrillo, *Pittier* 1195. Las Vueltas, *Tonduz* 12790.

85. Piper perpuberulum Trel., sp. nov.

An obscurely and transiently puberulent, fragrant shrub; leaves ovate or round-ovate, rather abruptly acuminate, subtruncately rounded at base, 6×9 to 9.5×12 cm., multiple-nerved with one nerve on each side from near the middle of the midrib and about 3 from the base; petiole 15 to 20 or 30 mm. long, winged; spikes 3×13 mm.; peduncle 20 to 25 mm. long; bracts round-subpeltate; berries depressed-globose; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 798,330, collected at Talamanca, Costa Rica, March, 1894, by H. Pittier and A. Tonduz (no. 8680).

RANGE: Costa Rica.

COSTA RICA: La Verbena, San José, *Tonduz* 8866.

86. Piper cercidiphyllum Trel., sp. nov.

A glabrous shrub; leaves round-ovate, subacuminate, subtruncate at base, 12 to 15×12 to 15 cm., multiple-nerved, with a branch from the middle of the midrib on each side and about 4 from the base; petiole 20 to 30 mm. long,

involute but scarcely winged; spikes 3×100 to 120 mm.; peduncle 10 mm. long; bracts rounded-subpeltate; berries short-oblong; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,421, collected along Quebrada Grande, near Tilarán, Province of Guanacaste, altitude 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 46110).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Golfito, Golfo Dulce, ? *Pittier* 9912 (J. D. Smith 7133).

87. **Piper dumetorum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 172. 1897.

TYPE LOCALITY: Turrialba, Costa Rica (*Tonduz* 8366, the type; "6366").

RANGE: Upper Reventazón Valley, Costa Rica.

88. **Piper zentanum** C. DC. Bot. Gaz. 70: 170. 1920.

TYPE LOCALITY: Hacienda de Zent, Costa Rica (*Tonduz* 14649, the type).

RANGE: Caribbean lowlands of Costa Rica.

89. **Piper cyphophyllum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 167. 1897.

Piper gibbifolium C. DC. Bot. Gaz. 70: 181. 1920.

TYPE LOCALITY: "Costa Rica" (*Pittier* 895, the type, at Brussels).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Hacienda de Zent, *Tonduz* 14649 in part, the type of *P. gibbifolium*. Finca Montecristo, *Standley & Valerio* 48617.

90. **Piper falcigerum** Trel., sp. nov.

A shrub, glabrous or with the nerves exceptionally puberulent beneath; leaves lanceolate, falcately attenuate, obliquely subcordulate, 9 to 11×25 to 30 cm., submultiple-nerved with 5 to 6 strong nerves on each side from below the upper third and 2 to 4 delicate ones from the base; petiole 10 to 15+3 mm. long, not winged; stipules about equaling the petiole; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,323, collected at El Silencio, near Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44747).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Tejona, Tilarán, *Standley & Valerio* 45817.

91. **Piper sublaevifolium** Trel.

Piper laevifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897. Not *P. laevifolium* Blume.

TYPE LOCALITY: Boca de Zhorquín, Talamanca, Costa Rica (*Tonduz* 8586, the type).

RANGE: Caribbean lowlands of Costa Rica.

92. **Piper sinuatifolium** Trel., sp. nov.

A shrub, glabrous except for the appressed-pubescent nerves; twigs white-granular; leaves sinuately obliquely ovate-elliptic, subacuminate, the very inequilateral base subcordulate, 15×25 cm., pinnately or submultiple-nerved with about 8+7 nerves; petiole 15+3 mm. long, not winged; spikes (young) 2×35 mm., with granular peduncle 7 mm. long; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,307,377, collected at Los Ayotes, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45537).

RANGE: Pacific slope of Costa Rica.

93. **Piper melanocladum** C. DC. Bot. Gaz. 70: 176. 1920.

TYPE LOCALITY: Río Ariei, Costa Rica (*Pittier* 9370, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 13148. Hamburg Finca, *Standley & Valerio* 48658. Pejivalle, *Standley & Valerio* 47139.

94. Piper tortuosipilum Trel., sp. nov.

A shrub, very sparsely crisp-villous throughout for a time, with long soft hairs; leaves elliptic-ovate or subquadrate, sharply acuminate, inequilaterally cordulate with one side shorter, 8×15 to 10×22 cm., submultiple-nerved from below the middle, the nerves about 5+6; petiole 10+3 mm. long; spikes 3×90 to 100 mm., pointed; peduncle 10 mm. long; bracts transversely subpeltate, subciliolate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,618, collected at El Muñeco, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March, 1926, by Paul C. Standley and Juvenal Valerio (no. 51026).

RANGE: Mountains of central Costa Rica.

COSTA RICA: El Muñeco, *Standley* 33941, 33944; *Standley & Valerio* 50973, 51017, 51239, 51256. La Estrella, *Standley* 39187. Orosi, *Standley* 39747. Peralta, *Stevens* 331, 336. La Hondura, *Standley* 37758, 37794.

95. Piper gracilipedunculum Trel., sp. nov.

A glabrous shrub; leaves elliptic-subobovate, acuminate, equilaterally acute at base, 5 to 6.5×10 to 15 cm., pinnately nerved from below the middle, the nerves 3×2 with the uppermost looping into 1 or 2 shorter nerves above; petiole 10 mm. long, winged at base; spikes 3×25 mm., mucronate; peduncle slender, 10 mm. long; bracts roundish or triangular-subpeltate, ciliolate; stigmas 3, sessile; berries depressed, somewhat elongate with the rachis.

Type in the U. S. National Herbarium, no. 1,307,496, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February, 1926, by Paul C. Standley and Rubén Torres (no. 47519).

RANGE: Central highlands of Costa Rica.

COSTA RICA: With the type, *Standley & Torres* 47582, 47604. La Palma, *Standley* 33159. Santa María de Dota, *Standley* 42095. Yerba Buena, *Standley & Valerio* 49198.

96. Piper surubresanum Trel., sp. nov.

A glabrous shrub; twigs somewhat pale-granular at the nodes; leaves elliptic, acuminate at both ends, 7×13 to 15 cm., submultiple-nerved from below the upper third, the stronger nerves about 5×2, drying thin, paler beneath; petiole scarcely 10 mm. long, involute, not winged; spikes (young) 2×40 mm., drying red; peduncle scant 10 mm. long; bracts triangular-subpeltate, glabrate.

Type in the U. S. National Herbarium, no. 861,103, collected along Río Surubres, San Mateo, Costa Rica, altitude 250 meters, February 14, 1909, by P. Biolley (no. 17353).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Río Surubres, *Biolley* 2655. About Tilarán, *Standley & Valerio* 45726, 46098, 46111.

97. Piper decurrens C. DC. Journ. Bot. Brit. & For. 4: 215. 1866.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Hoffmann* 853, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Río Poás, *Tonduz* 1707. La Ventolera, Volcán de Poás, *Standley* 34665, 34725, 34734, 34735.

98. Piper micranthera C. DC. Linnaea 37: 354. 1872.

TYPE LOCALITY: La Barranca, Nicaragua [Costa Rica], *Oersted* 877, the type.

RANGE: Pacific slope of Costa Rica.

99. Piper opacibracteum Trel., sp. nov.

A glabrous shrub, sometimes epiphytic; leaves lance-oblong, slender-acuminate, subequilaterally rounded at base, 4 to 5×15 cm., pinnately nerved from below the middle, the nerves about 5×2, drying hard-papery and green; petiole 5 mm.

long, not winged; spikes 3×70 mm., drying brown; peduncle scant 5 mm. long; bracts rounded-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,414, collected at La Tejona, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 25, 1926, by Paul C. Standley and Juvenal Valerio (no. 45899).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Tilarán, *Standley & Valerio* 45844.

100. Piper unguiculiferum Trel., sp. nov.

A glabrous shrub; leaves lance-elliptic, acuminate, subequilaterally rounded at base with the margin typically unguiculately inrolled, 6 to 8×17 to 18 cm., submultiple-nerved from the lower half, the nerves 4×2; petiole scant 10 mm. long, not winged; spikes 2×80 mm.; peduncle scant 10 mm. long; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,485, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 47003).

RANGE: Upper Reventazón Valley, Costa Rica.

101. Piper xiroresanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Tonduz* 9271, the type).

RANGE: Caribbean piedmont of Costa Rica.

102. Piper terrabanum C. DC. Bull. Soc. Bot. Belg. 30[1]: 217. 1891.

TYPE LOCALITY: Térraba, Costa Rica (*Tonduz* 3604, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Boruca, *Tonduz* 4664, 6855, 6862. Palmar, *Tonduz* 6750. Rodeo de Pacaca, *Pittier* 3266.

103. Piper longistipulum C. DC. Bot. Gaz. 70: 175. 1920.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Pittier* 8001, the type).

RANGE: Caribbean border between Costa Rica and Nicaragua.

104. Piper peltaphyllum C. DC. Bull. Soc. Bot. Belg. 30[1]: 220. 1891.

TYPE LOCALITY: Carrillo Road, Costa Rica (*Pittier* 2522, the type).

RANGE: Caribbean piedmont of Costa Rica.

104a. Piper peltaphyllum lasvueltasanum C. DC. Bot. Gaz. 70: 172. 1920.

TYPE LOCALITY: Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13189, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Río Tuis, *Tonduz* 8164.

105. Piper veraguense C. DC. in DC. Prodr. 16[1]: 294. 1869.

TYPE LOCALITY: "Costa Rica and Veragua," Costa Rica and Panama (*Warscewicz* in Herb. Boissier).

Not recently recognized, and very possibly a prior name for the preceding species.

106. Piper copeyanum (C. DC.) Trel.

Piper pulchrum copeyanum C. DC. Bot. Gaz. 70: 189. 1920.

Piper pulchrum costaricense C. DC. Bull. Soc. Bot. Belg. 29[1]: 70. 1890; 30[1]: 213. 1891. Not *P. costaricense* C. DC.

TYPE LOCALITY: Santa Rosa de Copey, Costa Rica (*Tonduz* 12198, the type).

RANGE: High divide of central Costa Rica.

COSTA RICA: Santa Rosa de Copey, *Tonduz* 12247. El Copey, *Tonduz* 11890. Santa María de Dota, *Pittier* 2272; *Standley* 42831; *Standley & Valerio* 43258. El Muñeco, *Standley* 33649. Escasú, *Standley* 32626. Aserrí to Tarbaca, *Standley* 41390. La Estrella, Cartago, *Standley* 39235. Río Poás, *Tonduz* 1743.

La Ventolera, Volcán de Poás, *Standley* 34662. Río Achiote to Sabana de las Chiquizás, *Pittier* 793.

107. Piper sagittifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 171. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7588, the type).

RANGE: Caribbean lowlands of Costa Rica and adjacent Nicaragua.

COSTA RICA: Valley of Aguas Buenas, *Pittier* 11035.

108. Piper glabrifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 163. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7553).

RANGE: Caribbean lowlands of northeastern Costa Rica.

109. Piper pseudo-glabrifolium Trel., sp. nov.

Piper glabrifolium Auct., p. p., as to Costa Rica.

Closely resembling *P. glabrifolium*, but the elliptic leaves not at all pandurately contracted.

Type in the DeCandolle Herbarium, collected at Santa María de Dota, Costa Rica, by A. Tonduz (no. 7853).

RANGE: High divide of central Costa Rica.

110. Piper pacacanum Trel.

Piper nobile minus C. DC. Bull. Soc. Bot. Belg. 30[1]: 208. 1891.

TYPE LOCALITY: Rodeo de Pacaca, Costa Rica (*Pittier* 3239, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Lagarto to Boruca, *Pittier* 4488. Buenos Aires, *Pittier* 6533. San Ramón, ? *Tonduz* 17779.

111. Piper subfuscum C. DC. Journ. Bot. Brit. & For. 4: 217. 1866.

Piper tablazosense C. DC. Bot. Jahrb. Engler 10: 288. 1888.

TYPE LOCALITY: Alto de la Cruz, Mount Candelaria, Costa Rica (*Hoffmann* 544, the type).

RANGE: High divide of central Costa Rica.

COSTA RICA: Tablazos, *Lehmann* 1752, type of *P. tablazosense*.

112. Piper ceibense C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 163. 1897.

TYPE LOCALITY: Buenos Aires, Río Ceibo, Costa Rica (*Pittier* 4902, the type; "6902").

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Cabeceras del Diquís, *Pittier* 10564. Golfito, Golfo Dulce, *Pittier* 9910.

113. Piper neurostachyum C. DC. Bull. Soc. Bot. Belg. 30[1]: 213. 1891.

TYPE LOCALITY: Juan Viñas, Costa Rica (*Pittier* 1869, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 12907 (J. D. Smith 7564). Boca de Zhorquín, *Tonduz* 8641.

114. Piper escuadranum Trel., sp. nov.

A shrub, glabrous except for the puberulent nerves beneath; leaves broadly ovate, obscurely subacuminate, nearly equilaterally deeply cordate with V-shaped sinus about equaling the petiole, 24×35 cm., multiple-nerved with about 4 ascending nerves on each side of the lower half of the midrib and as many more spreading from the base; petiole 6 cm. long, rather narrowly winged; spikes (young) 4×50 mm.; peduncle 1 cm. long; bracts quadrangularly subpeltate, glabrous.

Type in the U. S. National Herbarium, nos. 1,307,266–1,307,267, collected in dense oak and bamboo forest near Laguna de la Escuadra, northeast of El Copey, Province of San José, Costa Rica, altitude 2,000 to 2,200 meters, December 16, 1925, by Paul C. Standley (no. 41965).

RANGE: High divide of central Costa Rica.

115. Piper irrasum Trel., sp. nov.

A shrub; twigs crisp-velvety; leaves subelliptic-ovate, short-acuminate, nearly equilaterally deeply cordate with nearly closed sinus about equaling the petiole, 20×30 cm., submultiple-nerved, with 4 upcurved nerves on each side from below the upper third and as many more from the base, crisp-velvety beneath; petiole crisp-velvety, 70 mm. long; spikes 7×360 mm.; peduncle 15 mm. long, glabrescent; bracts triangular-subpeltate, ciliate; berries short-oblong, truncate; stigmas 3, small, sessile.

Type in the U. S. National Herbarium, no. 1,307,609, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 50961).

RANGE: Upper Reventazón Valley, Costa Rica.

116. Piper palmanum Trel., sp. nov.

A tree 5 to 10 meters tall; leaves broadly ovate, obtuse, nearly equilaterally deeply cordate with overlapping rounded lobes shorter than the petiole, 36×50 cm., multiple-nerved with 4 upcurved branches on each side of the midrib from below the upper third and as many more from the base, the nerves villous beneath; petiole sparsely villous, with a few fleshy emergences, winged, 80 mm. long; spikes 7 to 12×450 mm.; peduncle 30 mm. long, glabrous; bracts triangular-subpeltate, ciliate; berries oblong, truncate; stigmas 3, broad, sessile.

Type in the U. S. National Herbarium, nos. 1,229,340–1,229,342, collected at La Palma, Province of San José, Costa Rica, altitude 1,600 meters, February 3, 1924, by Paul C. Standley (no. 33112).

RANGE: High mountains of central Costa Rica.

117. Piper aserrianum Trel., sp. nov.

A shrub; twigs brown-tomentose-villous; leaves broadly ovate, obtuse, subequilaterally deeply cordate with narrow or closed sinus surpassing the petiole, 27×40 cm., multiple-nerved, with 4 ascending nerves on each side from below the upper third and as many more from the base, the nerves crisp-villous beneath; petiole brown-villous, 30 to 70 mm. long; spikes (young) 4×70 mm., with glabrate peduncle 10 mm. long.

Type in the U. S. National Herbarium, no. 1,229,695, collected between Aserrí and Tarbaca, Province of San José, Costa Rica, altitude 1,600 to 1,900 meters, February 12, 1924, by Paul C. Standley (no. 34151).

RANGE: High mountains of central Costa Rica.

COSTA RICA: Fraijanes, Alajuela, *Standley & Torres* 47595. Cerro de la Carpintera, *Standley* 35638.

118. Piper cincinnatum Trel., sp. nov.

A shrub; twigs sparingly soft-hairy or glabrescent, fleshy-warty at the nodes; leaves broadly elliptic, short-acuminate, somewhat inequilaterally cordate with open sinus, 24×40 cm., multiple-nerved, with 4 upcurved nerves on each side from below the upper third and 2 or 3 from the base, substellate-hairy beneath especially on the midrib; petiole longer than the lobes, 70 to 90 mm., winged, dorsally hairy, with numerous fleshy emergences; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,263, collected at La Colombiana Farm of the United Fruit Co., Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36778).

RANGE: Caribbean lowlands of central Costa Rica.

119. Piper clavuliger Trel., sp. nov.

A shrub or small tree 3 to 7 meters tall; twigs glabrous, with fleshy emergences about the nodes; leaves round-ovate, obtuse or short-pointed, nearly equilaterally deeply cordate with narrow sinus subequal to the petiole, 30×45

cm., multiple-nerved, with 5 upcurved nerves on each side from the lower half and as many from the base, puberulent on the nerves beneath and with emergences on the midrib; petiole as much as 100 mm. long, winged, glabrous, with oblong emergences; spikes (young) 4×90 mm., becoming 5×250 mm., with subpuberulent peduncle 30 to 55 mm. long.

Type in the U. S. National Herbarium, no. 1,307,489, collected in the vicinity of Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 47088).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: El Muñeco, Cartago, *Standley* 33919; *Standley & Valerio* 51033. La Hondura, *Standley* 37771.

120. Piper cenocladum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 168. 1897.

TYPE LOCALITY: Tsaki, Talamanca, Costa Rica (*Tonduz* 9533, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, Tucurrique, *Tonduz* 12857 (J. D. Smith 7565). Finca Montecristo, *Standley & Valerio* 48559.

121. Piper signatum Trel., sp. nov.

A shrub, sparsely villous nearly throughout; leaves elliptic above the lateral sinus, subobovate because of the single pendent auricle which surpasses the petiole, short-acuminate, 13 to 15×30 cm., submultiple-nerved, with about 4 upcurved nerves from below the middle on each side and as many more spreading from the base on the auricled side; petiole 30 to 40 mm. long, winged; spikes pendent, 12×250 mm.; peduncle thick, 20 mm. long, glabrous; bracts lunulately subpeltate; berries suboblong, truncate; stigmas 3; sessile.

Type in the U. S. National Herbarium, no. 1,307,608, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 50958).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, *Standley* 33447, 33466, 33575; *Standley & Torres* 51006. Orosi, *Standley* 39727.

122. Piper ciliatifolium Trel., sp. nov.

A softly subhirsute shrub; leaves elliptic above the lateral sinus, but obovate because of the single auricle as long as the petiole, gradually pointed, 15×30 cm., submultiple-nerved, with about 4 upcurved nerves from each side of the lower half and as many more from the base on the auricled side, long-ciliate; petiole 30 mm. long, winged; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,229,416, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36770).

RANGE: Reventazón lowlands, Costa Rica.

123. Piper bullulaefolium Trel., sp. nov.

A velvety-subtomentose shrub; leaves elliptical-subovate above the lateral sinus, subobovate from the (usually) single pendent article equaling the petiole, gradually subacuminate, 10 to 15×20 to 30 cm., submultiple-nerved with about 4 upcurved nerves from the lower half on each side and about as many radiating from the base in the auricle, bullulate-rugose; petiole 40 to 50 mm. long; spikes (young) 2×180 mm., with peduncle 15 mm. long; bracts roundish-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 1,307,368, collected at Los Ayotes, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45363).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44657, 46463 with biauriculate base.

124. Piper tinctum Trel., sp. nov.

Close to the foregoing but villous and not bullulate; spikes 4 to 5× 350 mm.; peduncle 30 mm. long.

Type in the U. S. National Herbarium, no. 1,307,372, collected at Los Ayotes, near Tilarán, Province of Guanacaste, Costa Rica, altitude 600 to 700 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45460).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Vicinity of Tilarán, *Standley & Valerio* 45280, 45800.

125. Piper biseriatum C. DC. Bot. Gaz. 70: 178. 1920.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11036, the type).

RANGE: Eastern Costa Rica, toward Panama.

126. Piper dasypogon C. DC. Bot. Gaz. 70: 187. 1920.

TYPE LOCALITY: Buenos Aires, Costa Rica (*Pittier* 10641, the type).

RANGE: Diquís Valley, Pacific slope of Costa Rica.

127. Piper magnilimbum C. DC. Bot. Gaz. 70: 177. 1920.

Piper obliquum Auct., as to Costa Rica.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11032, the type).

RANGE: Eastern Costa Rica.

COSTA RICA: With the type, *Pittier* 11073, "11037."

128. Piper fimbriulatum C. DC. Bull. Soc. Bot. Belg. 30 [1]: 207. 1891.

TYPE LOCALITY: El General, Costa Rica, *Tonduz* 3393 ("3398") the type.

RANGE: Pacific slope of Costa Rica.

129. Piper pentagonum Trel., sp. nov.

A shrub; twigs crisp-velvety; leaves subpandurately obovate, short-acuminate, unequally cordate with narrow sinus, the longer lobe half as long as the petiole, 12 to 15×22 to 25 cm., multiple-nerved, with 3 to 4 upcurved branches on each side from below the upper third and as many more spreading from the base, hirtellous on the nerves beneath; petiole 60 to 80 mm. long, winged, crisp-hirtellous; spikes (young) 3×65 mm., mucronate, on a hirtellous peduncle 5 mm. long; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,307,543, collected at Finca Montecristo, Río Reventazón below Cairo, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48559).

RANGE: Caribbean lowlands of Costa Rica.

130. Piper pseudo-fimbriulatum Trel., sp. nov.

A shrub; twigs transiently hairy; leaves broadly elliptic, blunt-acuminate, deeply laterally cordate with overlapping lobes, 20×35 cm., submultiple-nerved with 3 or 4 upcurved nerves from the lower half of each side and 4 or 5 spreading from the base, the nerves stiff-villous beneath; petiole 80+10 or 15 mm. long, winged; spikes 4×300 mm. or more; peduncle 10 to 15 mm. long; bracts subpeltate, long-fimbriate.

Type in the U. S. National Herbarium, no. 577,121, collected at El General, Costa Rica, altitude 600 meters, February, 1891, by H. Pittier (no. 3601).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Boruca to Térraba, ? *Pittier* 4657.

131. Piper exiguispicum Trel., sp. nov.

A shrub ?; twigs densely subtomentose; leaves broadly obovate-elliptic, sharp-acuminate, unequally laterally cordate with the larger lobe surpassing the petiole, 20×23 cm., submultiple-nerved with about 4 upcurved branches from

the lower half on each side and 2 to 4 from the base, more or less persistently pubescent on both sides; petiole 45+10 or 15 mm. long, densely hairy, winged; spikes cordlike, 2.5×220 mm.; peduncle 25 to 30 mm. long, loosely hairy; bracts subpeltate, rusty-hairy.

Type in the U. S. National Herbarium, no. 798,333, collected at Boca de Zhorquín, Talamanca, Costa Rica, March, 1894, by A. Tonduz (no. 8641).

RANGE: Caribbean slope of Costa Rica.

132. Piper perlongipes Trel., sp. nov.

A somewhat pubescent shrub, very suggestive of *P. auritum amplifolium;* leaves ovate-acute, unequally laterally cordate with overlapping lobes, on winged petiole 30 to 40 mm., longer on one side; spikes 3 to 4×300 mm.; peduncle slender, 90 mm. long.

Type in the U. S. National Herbarium, no. 1,307,477, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 46834).

RANGE: Reventazón Valley, Costa Rica, perhaps also represented from Chinandega, Nicaragua, *Baker* 85.

COSTA RICA: Tuis, *Tonduz* 8166, 11519. Shirores, *Tonduz* 9264.

133. Piper auritum amplifolium C. DC. in DC. Prodr. 16 [1]: 321. 1869.

TYPE LOCALITY: "Costa Rica" (*Hoffmann* 761, the type).

RANGE: Widespread through Central America in various scarcely distinguishable forms.

COSTA RICA: Limón, *Pittier* 12689. Finca Montecristo, *Standley & Valerio* 48450. Hacienda de Zent, *United Fruit Co.* 257. Río San Juan, *Oersted* 827. Puerto Viejo and Sarapiquí River, *Biolley* 7443. Carrillo Road, *Pittier* 1194, 2528. Las Vueltas, *Tonduz* 12859. Tuis, *Tonduz* 11519 (J. D. Smith 7331). Juan Viñas, *Cook & Doyle* 304, 364. Mount Aguacate, *Oersted* 826. Las Pavas, *Standley* 36069. San José, *Tonduz* 3174. Río Birrís, *Pittier* 3202. Pacific slope, *Biolley* 17554. Surubres, San Mateo, *Pittier* 7052. Quebrada Grande, Tilarán, *Standley & Valerio* 46114. Río Corozal, Santo Domingo de Golfo Dulce, *Tonduz* 9929 (J. D. Smith 7135). Punta Mala, *Tonduz* 6796.

134. Piper auritifolium Trel., sp. nov.

A shrub resembling *P. auritum,* with microscopically papillate stem; leaves 12 to 13×20 to 23 cm., sparsely appressed-pubescent above but quite glabrous beneath; spikes (young) 2×50 to 100 mm., the glabrous peduncle 10 mm. long.

Type in the U. S. National Herbarium, no. 1,307,561, collected at Hamburg Finca, Río Reventazón below Cairo, Province of Limón, Costa Rica, altitude 50 meters, February 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48773).

RANGE: Caribbean lowlands of Costa Rica.

135. Piper silvicola C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7611, the type).

RANGE: Lowlands of northeastern Costa Rica.

COSTA RICA: Rio Naranjo, ? *Tonduz* 7536.

136. Piper mirabile Trel., sp. nov.

A thick-trunked tree 6 to 7 meters tall, essentially glabrous except for the puberulent nerves beneath; leaves elongate-elliptic, obscurely blunt- or emarginulate-acuminate, obliquely rounded at base or obscurely subcordulate, 10 to 12×20 to 25 cm., submultiple-nerved with about 3 impressed upcurved nerves on each side of the lower half and 2 or 3 from the base, bronzing; petiole 40 to 50 mm. long, somewhat fleshy-warty like the twig, winged; spikes pendent, 6 to 8×370 mm.; bracts suborbicular, ciliate-fimbriate; ovary depressed-ellipsoid; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,181,894, collected at Santa Clara de Cartago, Costa Rica, altitude 1,950 meters, July 20, 1923, by William R. Maxon and A. D. Harvey (no. 8246).

RANGE: Upper Reventazón Valley, Costa Rica.

137. Piper evasum Trel., sp. nov.

A shrub, essentially glabrous except for the tomentulose fleshy-warty twigs and petioles and the pubescent nerves beneath; leaves regularly elliptic, subacuminate, equilaterally cordate with open sinus scarcely 15 mm. deep, 16×34 cm., submultiple-nerved with about 5 upcurved nerves from below the upper third on each side and about 2 from the base; petiole 30 mm. long, thick and winged; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,366, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 1926, by Paul C. Standley and Juvenal Valerio (no. 45280).

RANGE: Pacific slope of Costa Rica.

138. Piper longevillosum Trel., sp. nov.

A soft shrub with long-villous twigs; leaves broadly elliptic, subacuminate, slightly inequilaterally cordate with shallow sinus or subauriculate with the larger lobe covering the petiole, 12×18 to 15×22 cm., submultiple-nerved with about 4 upcurved nerves from the lower half on each side and as many more from the base; petiole 40 mm. long, winged, villous like the base of the nerves beneath; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,322, collected at El Silencio, near Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44696).

RANGE: Pacific slope of Costa Rica.

139. Piper pittieri C. DC. Bull. Soc. Bot. Belg. 29^2: 69. 1890; 30^1: 204. 1891.

TYPE LOCALITY: Between Turrialba and Río Birrís, on Volcán de Irazú, Costa Rica, at 2,400 meters altitude (*Pittier* 376, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Turrialba, *Pittier* 13234 (J. D. Smith 7507). Achiote, Volcán de Poás, *Tonduz* 10794; *Standley* 34612. Laguna del Reventado, Volcán de Irazú, 3,000 meters, noted as the highest Costa Rican altitude for a Piper, *Pittier* 14116; *Tonduz* 4244. Cerro de las Caricias, Heredia, *Standley & Valerio* 52235. Cerro de las Lajas, *Standley & Valerio* 51555.

140. Piper trimetrale C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 159. 1897.

TYPE LOCALITY: Río Tuis, Costa Rica (*Tonduz* 8169, the type).

RANGE: Reventazón Valley, Caribbean slope of Costa Rica.

141. Piper riparense C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 173. 1897.

TYPE LOCALITY: Buenos Aires, Río Hacúm, Costa Rica (*Tonduz* 4893, the type).

RANGE: Diquís Valley, Pacific slope of Costa Rica.

142. Piper euryphyllum C. DC. Bot. Gaz. 70: 178. 1920.

Piper triseriale C. DC. Bot. Gaz. 70: 187. 1920.

TYPE LOCALITY: La Palma, Costa Rica (*Tonduz* 12666, the type).

RANGE: High mountains of central Costa Rica.

COSTA RICA: La Palma, *Pittier* 12663, type of *P. triseriale*.

143. Piper otophorum C. DC. Bull. Soc. Bot. Belg. 30^1: 220. 1891.

TYPE LOCALITY: Siquirres, Costa Rica (*Pittier* 3183, the type).

RANGE: Caribbean lowlands of northeastern Costa Rica.

COSTA RICA: Río Naranjo, *Tonduz* 7551.

144. Piper auriculiferum Trel., sp. nov.

A shrub, slightly pubescent on the nerves beneath, the twigs white-granular; leaves inequilaterally sublanceolate- or oblanceolate-elliptic, acuminate, laterally semicordate with the lobe or auricle equaling and covering the petiole, 6.5 to 8×15 to 18 cm., submultiple-nerved with about 5 upcurved nerves from below the middle on each side and 2 spreading from the base; petiole 10 mm. long, scarcely winged; spikes 4×60 mm.; peduncle 10 mm. long; bracts triangular-subpeltate; berries round-oblong, convallately truncate; stigmas 2, sessile.

Type in the U. S. National Herbarium, no. 1,307,316, collected at El Silencio, near Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44648).

RANGE: Pacific slope of Costa Rica.

145. Piper biauritum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Tonduz* 9270, the type).

RANGE: Caribbean slope of Costa Rica.

146. Piper insolens Trel., sp. nov.

A shrub; twigs for a time dingy-villous; leaves obliquely lance-ovate, falcate-acuminate, bicordulate with lateral sinus, 6 to 7×14 to 16 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, sparingly dingy-villous above, the nerves densely crisp-hairy beneath; petiole 10 mm. long, covered by the blade, villous, not winged; spikes noted as greenish white.

Type in the U. S. National Herbarium, no. 1,307,288, collected at Santa María de Dota, Province of San José, Costa Rica, altitude 1,600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 43306).

RANGE: High divide of central Costa Rica.

147. Piper disparifolium Trel., sp. nov.

A nodose shrub, glabrous except for the obscurely appressed-puberulent nerves beneath; leaves lance-ovate, acuminate, obliquely cordulate, 8 to 10×20 to 22 cm., pinnately nerved from below the middle, the nerves 6 or 7×2; petiole 8+2 mm. long, not winged; spikes (young) 2×30 mm.; peduncle 10 mm. long; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,484, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 46993).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, Río Navarro, Cartago, *Standley & Valerio* 51018. Pejivalle, *Standley & Valerio* 47082. Peralta, *Stevens* 372.

148. Piper celatipetiolum Trel., sp. nov.

A glabrous shrub; leaves elliptic-ovate or subobovate, falcate-acuminate, very unequally cordulate, 7 to 7.5×16 cm., pinnately nerved from below the upper third, the nerves about 6×2; petiole 5 mm. long, granular-papillate; spikes 3×45 to 55 mm.; peduncle 10 mm. long; bracts triangular-subpeltate; berries obconical, truncate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,229,492, collected at Capulín, Province of Alajuela, Costa Rica, altitude 80 meters, April 2, 1924, by Paul C. Standley (no. 40178).

RANGE: Pacific lowlands of Costa Rica.

149. Piper subaspericaule C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.

Piper trichocladum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 167. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7625, the type; this is also the type of *P. trichocladum*).

RANGE: Caribbean lowlands of Costa Rica and Nicaragua.

COSTA RICA: Río Naranjo, *Tonduz* 7660.

150. Piper virgultorum C. DC. Bot. Gaz. 70: 173. 1920.

TYPE LOCALITY: Tsuritkub, Talamanca, Costa Rica (*Tonduz* 8650, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Boca de Zhorquín (*Tonduz* 8570; ? 8577). Las Vueltas, ? *Tonduz* 12823. La Florida, ? *Lankester*, in 1925. Without definite locality, *Brade* 2439. Turrialba, ?*Tonduz* 4113.

151. Piper chrysostachyum C. DC. Bull. Soc. Bot. Belg. 30[1]: 207. 1891.

TYPE LOCALITY: Río Surubres, San Mateo (*Biolley* 4073, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Pittier* 6526, 6535. Río La Barranca, San Juan de San Ramón, *Tonduz* 17777.

152. Piper vicinum Trel., sp. nov.

General characters of *P. chrysostachyum*, but the nerves subpubescent beneath, and with glabrous bracts and pistils.

Type in the U. S. National Herbarium, no. 577,145, collected at "Yuavin," [?Zhorquín], Costa Rica, altitude 700 meters, March, 1892, by A. Tonduz (no. 6635).

RANGE: Caribbean slope of Costa Rica.

153. Piper pelliticaule Trel., sp. nov.

A shrub; twigs brown-puberulent and with intermingled longer straight hairs; leaves broadly elliptic, acutely short-acuminate, unequally rounded at base, 8 to 10.5×16 to 19 cm., pinnately nerved from below the middle, the nerves about 6+7, evanescently somewhat hirtellous above, tomentulose and villous-hirsute on the nerves beneath; petiole 10 or 15+3 mm. long, brown-hirtellous, winged at base; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,307,499, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,600 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47539).

RANGE: High central divide of Costa Rica.

COSTA RICA: Río Virilla. ? *Tonduz* 17770.

154. Piper anisophyllum Trel., sp. nov.

Piper dilatatum acutifolium C. DC. Bull. Soc. Bot. Belg. 30[1]: 217. 1891.

TYPE LOCALITY: El General, Costa Rica (*Tonduz* 3385, the type).

RANGE: Pacific slope, Costa Rica.

COSTA RICA: With the type, *Tonduz* 3392. Tilarán, Guanacaste, *Standley & Valerio* 44228. Boruca, *Pittier* 6747.

155. Piper pseudodilatatum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.

TYPE LOCALITY: Punta Mala, Costa Rica (*Tonduz* 6797, the type).

RANGE: Pacific lowlands of Costa Rica.

156. Piper zacatense C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Boca Zacate, Costa Rica (*Pittier* 6828, the type).

RANGE: Pacific lowlands of Costa Rica.

156a. Piper zacatense percaudatum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Golfito, Golfo Dulce, *Pittier* 9914, the type; distributed also as J. D. Smith 7132.

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Río Corozal, Santo Domingo, *Pittier* 10002 (J. D. Smith 7131). Río Colorado, Golfo Dulce, *Pittier* 9991 (J. D. Smith 7144).

157. Piper uvitanum C. DC. Bot. Gaz. 70: 182. 1920.

TYPE LOCALITY: La Uvita, Limón, Costa Rica (*Pittier* 12690, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Limón, *Debeaux* 59.

158. Piper alajuelanum Trel., sp. nov.

A shrub, glabrous except for the obscurely puberulent nerves beneath; leaves obliquely subelliptic-oblong, acuminate, rounded at least on one side at base, 5 to 7×12 to 16 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, cancellately venulose; petiole 10 mm. long, not winged; spikes 2 to 3×85 mm.; peduncle slender, 10 to 15 mm. long, white-granular like the twigs; bracts lunulate-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,164, collected at Nuestro Amo, Alajuela, Costa Rica, altitude 800 meters, February, 1911, by Otón Jiménez (no. 988).

RANGE: Pacific slope of Costa Rica.

159. Piper villosisquamulum Trel., sp. nov.

A shrub; twigs glabrous, pale-granular; leaves obliquely elliptic, long-acuminate, rounded at base or subcordulate at least on one side, 6 to 8×18 to 23 cm., pinnately nerved from below the middle, the nerves about 7+6, loosely and deciduously villous beneath with the veins appressed-pubescent; petiole 8+2 mm. long, glabrous, winged only at base; spikes filiform, 2×150 mm.; peduncle 10 to 15 mm. long, obscurely velvety or glabrous; bracts roundish-subpeltate, ciliolate; ovary round-truncate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,229,448, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37799).

RANGE: High central divide of Costa Rica.

COSTA RICA: With the type, *Standley* 37757.

160. Piper rhodostachyum Trel., sp. nov.

A small crisp-villous shrub; leaves obliquely lanceolate, falcate-attenuate, subcordulate on one side, 3×10 cm., subrugose, pinnately nerved from below the middle, the nerves 4+3, prominent beneath; petiole scarcely 2+2 mm. long; spikes (young) 2×15 mm., pink.

Type in the U. S. National Herbarium, no. 1,318,150, collected at Reventazón, Costa Rica, August 4, 1927, by C. H. Lankester (no. 1163).

RANGE: Reventazón Valley, Costa Rica.

161. Piper polytrichum C. DC. Candollea 1: 110. 1923; Schroeder, Candollea 3: 138. 1926.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11070, the type; "10070").

RANGE: Mountains of southeastern Costa Rica.

COSTA RICA: With the type, *Pittier* 11071.

162. Piper nigricaule Trel., sp. nov.

A shrub; twigs blackening, sparsely crisp-pubescent; leaves elliptic-sublanceolate, unequally cordulate, 5×13 to 15 cm., pinnately nerved from below the middle, the nerves 6×2, transiently somewhat hairy on both sides and persistently pubescent on the nerves; petiole 5+2 mm. long, hairy, winged at base; spikes 3×50 to 88 mm.; peduncle slender, 10 mm. long, glabrate; bracts lunulate-subpeltate, ciliolate; berries obpyramidal-triquetrous; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 577,290, collected at Santo Domingo de Golfo Dulce, Costa Rica, March, 1910, by A. Tonduz (no. 9959). Distributed also by John Donnell Smith as no. 7139 (sheets 596,520 and 596,522 in the U. S. National Herbarium).

RANGE: Pacific coast region of Costa Rica.

163. **Piper scleromyelum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 167. 1897.

TYPE LOCALITY: Tsuritkub, Talamanca, Costa Rica (*Tonduz* 8675, the type).

RANGE: Caribbean slope of Costa Rica.

164. **Piper subsessilifolium** C. DC. Bull. Soc. Bot. Belg. 30[1]: 216. 1891.

Piper subsessilifolium palmanum C. DC. Bot. Gaz. 70: 183. 1920.

TYPE LOCALITY: Río Navarrito, Costa Rica, *Pittier* 2436 ("2435"), the type.

RANGE: Mountains of central Costa Rica.

COSTA RICA: La Palma, *Tonduz* 12662, type of var. *palmanum*. Alto de la Estrella, Cartago, *Standley* 39108, 39232 with lance-oblong leaves 3.5 to 4.5×13 to 15 cm. El Muñeco, Río Navarro, *Standley* 33426, 33436, 33567, 33628, 33651; *Standley & Torres* 51110; *Standley & Valerio* 51027. La Hondura, *Standley* 36496, with narrow leaves.

165. **Piper concepcionis** Trel., sp. nov.

A spreading or subrepent, essentially glabrous shrub; leaves oblong- or ovate-elliptic, acuminate, nearly equilaterally rounded at base, 8 to 13×20 to 25 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, congested below; petiole 10 to 20 mm. long, not winged; spikes (young) 2×35 mm., drying red, with peduncle 5 mm. long; bracts lunulate-subpeltate.

Type in the U. S. National Herbarium, no. 798,403–798,404, collected at La Concepción, plains of Santa Clara, Costa Rica, February, 1896, by John Donnell Smith (no. 6749).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37123, 37131, 37319.

166. **Piper arundinetorum** Trel., sp. nov.

A weak subscandent glabrous shrub; leaves narrowly elliptic, acuminate, subobtuse at the convallate base, 4 to 6×13 to 16 cm., submultiple-nerved from the lower half, the nerves 5×2, drying bright green and veiny; petiole 5 mm. long, not winged; spikes 3×40 mm.; peduncle 10 mm. long; bracts triangular-subpeltate, the pale margin coarsely fimbriate; berries oblong-truncate; stigmas 2, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,268, collected in oak and bamboo forest, near Laguna de la Escuadra, El Copey, Province of San José, Costa Rica, altitude 2,100 meters, December 16, 1925, by Paul C. Standley (no. 41967).

RANGE: Central mountains of Costa Rica.

167. **Piper sulcinervosum** Trel., sp. nov.

A shrub; twigs somewhat crisp-pubescent; leaves elongate-lanceolate, long-acuminate, the narrowed base nearly equally subobtuse, 5.5 to 7×17 to 18 cm., submultiple-nerved from the lower third, the sulcate nerves 5 or 6×2 with the lower congested, and slightly hairy above; petiole 3 to 7 mm. long, somewhat crisp-pubescent, not winged; spikes (young) 3×40 mm., purple; peduncle 7 mm. long, slightly crisp-pubescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,701, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,800 meters, February, 1924, by Paul C. Standley (no. 35569).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 35634, 35707. Orosi, Cartago, *Standley* 39674.

168. Piper pendens Trel., sp. nov.

A small pendent epiphytic shrub; twigs transiently crisp-pubescent; leaves elongate-lanceolate, gradually long-acuminate, subequally rounded at base, 3.5 to 4.5×12 to 15 cm., pinnately submultiple-nerved from below the middle, the impressed nerves about 5×2, approximate downward and sparsely velvety beneath, drying thin and paler beneath; petiole 5 mm. long, crisp-pubescent, not winged; spikes (young) 2×35 mm., sharp-mucronate, dark red; peduncle 10 mm. long, crisp-pubescent; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,307,584, collected at Yerba Buena, San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February 22, 28, 1926, by Paul C. Standley and Juvenal Valerio (no. 49822).

RANGE: High central divide of Costa Rica.

168a. Piper pendens infaustum Trel., var. nov.

A terrestrial shrub with less gradually acuminate leaves.

Type in the U. S. National Herbarium, no. 1,229,361, collected at El Muñeco, south of Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters February 8, 9, 1924, by Paul C. Standley (no. 33651).

RANGE: Upper Reventazón Valley, Costa Rica.

169. Piper pseudo-aduncum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 166. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River (*Biolley* 6914, the type).

RANGE: Caribbean slope of Costa Rica.

170. Piper bryogetum C. DC. Bot. Gaz. **70**: 175. 1920.

Piper bryogeton C. DC. Candollea **1**: 85. 1923.

TYPE LOCALITY: Trejos, Las Vueltas, Tucurrique, Costa Rica (*Pittier* 12939).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Hacienda de Zent, *Pittier* 14652. Río Hondo, Santa Clara, *Cook & Doyle* 563.

171. Piper matinanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 170. 1897.

TYPE LOCALITY: Matina, Costa Rica (*Pittier* 9759).

RANGE: Caribbean lowlands of Costa Rica.

172. Piper cabagranum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 173. 1897

TYPE LOCALITY: Cabagra, near Buenos Aires, Costa Rica (*Pittier* 6528, the type).

RANGE: Diquís Valley, Costa Rica.

173. Piper blepharilepidum Trel., sp. nov.

A shrub; twigs slender, glabrous, green-granular; leaves subelliptic, acuminate, inequilaterally obtuse at base, 4 to 6×11 to 15 cm., pinnately nerved from the lower half, the nerves about 5+4, sparingly appressed-pubescent beneath, drying green and green-granular; axillary scales long-ciliate; petiole 3+2 mm. long, glabrous, pale-granular, not winged; spikes (young) 2×50 mm.; peduncle 5 to 15 mm. long, glabrous, pale-dotted; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,434, collected at Quebrada Serena, Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46217).

RANGE: Pacific slope of Costa Rica.

174. Piper epigynium C. DC. Linnaea **37**: 346. 1872.

TYPE LOCALITY: Turrialba, Costa Rica (*Oersted* 858, the type).

RANGE: Reventazón Valley, Costa Rica.

175. Piper oppressum Trel., sp. nov.

A nearly glabrous shrub; leaves lance- or subovate-elliptic, long-acuminate, subobliquely acute at base, 5 to 7.5×13 to 16 cm., pinnately nerved from the lower half, the nerves (4 or 5×2) with some short intermediates and at most obscurely appressed-pubescent beneath; petiole slender, 10 to 20 or 30 mm. long, the longest narrowly winged to the end; spikes 2×30 to 40 or even 80 mm.; peduncle 5 mm. long; bracts inconspicuous, glabrous.

Type in the U. S. National Herbarium, no. 474,585, collected at Matambú, Nicoya Peninsula, Costa Rica, altitude 600 meters, May 23, 1903, by O. F. Cook and C. B. Doyle (no. 697).

RANGE: Pacific coast region of northern Costa Rica.

COSTA RICA: Nicoya, *Tonduz* 13962.

176. Piper esquivelanum Trel., sp. nov.

An essentially glabrous shrub, copiously brown-granular throughout; leaves ovate-elliptic, subacuminate, equilaterally acute at base, 6 to 7.5×13 to 15 cm., pinnately nerved from the lower half, the nerves about 4×2, microscopically puberulent on the nerves beneath; petiole 15 mm. long, winged toward the base; spikes 3×55 mm., slightly mucronate; peduncle 5 mm. long; bracts concave; berries subglobose; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,339, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45042).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Silencio, Guanacaste, *Standley & Valerio* 44644.

177. Piper machadoanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.

Piper dichotomum Auct., as to Nicaragua.

TYPE LOCALITY: Boca Machado, San Juan Valley, Nicaragua (*Pittier* 9638, the type).

RANGE: Caribbean lowlands of northern Costa Rica and adjacent Nicaragua.

COSTA RICA: Santa Clara, Las Delicias, *Biolley* 10676. Finca Montecristo, *Standley & Valerio* 48415, 48485, 48503, 48534, 48574, 48583. Hamburg Finca, *Standley & Valerio* 48667, 48690, 48715, 48743, 48757, 48777, 48819. La Colombiana Farm, *Standley* 36796, 36962, 36982.

178. Piper brachistopodum C. DC. Bot. Gaz. 70: 182. 1920.

TYPE LOCALITY: Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13143, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Las Vueltas, *Tonduz* 13128.

179. Piper nodosum C. DC. Bot. Gaz. 70: 185. 1920.

TYPE LOCALITY: Cañas Gordas, Costa Rica (*Pittier* 11072, the type).

RANGE: Mountains of southeastern Costa Rica.

180. Piper coactoris Trel., sp. nov.

A shrub; twigs evanescently hairy, copiously pale-granular near the nodes; leaves lance-elliptic, long-acuminate, inequilaterally acute at the base, 5.5 to 8×18 cm., pinnately nerved from below the middle, the nerves 5 or 6×2, rugose, roughened beneath by subappressed hairs; petiole 10+2 or 5 mm. long, glabrate, pale-granular, scarcely winged; spikes 3×60 to 85 mm., mucronate; peduncle 10 mm. long, pale-granular; bracts transversely subpeltate, ciliolate; berries oblong-subquadrate; stigmas minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,517, collected at Viento Fresco, Province of Alajuela, Costa Rica, altitude 1,600 to 1,800 meters, Feb-

ruary 13, 1926, by Paul C. Standley and Reubén Torres (no. 47935). Dedicated to the junior collector.

RANGE: High central divide of Costa Rica.

COSTA RICA: Viento Fresco, *Standley & Torres* 47776. Fraijanes, *Standley & Torres* 47535, 47583. San Isidro, Heredia, *Standley & Valerio* 49689, 49722, 52054.

181. **Piper villistipulum** Trel., sp. nov.

A shrub; twigs glabrous, pale-granular; leaves somewhat obliquely elliptic, acuminate, inequilaterally acute at base, 6 to 8.5×17 to 22 cm., pinnately nerved from below the middle, the nerves 6 or 7×2, sparsely upcurved-hirsute on the nerves and principal veins beneath, the caducous stipules villous; petiole 15 or 10+5 mm. long, winged at base only, pale-granular; spikes (young) 2×40 mm., mucronate; peduncle 5 to 10 mm. long, glabrous; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,686, collected at El Muñeco, south of Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33438).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: With the type, *Standley* 33942; *Standley & Valerio* 51014, 51030, 51103, 51245.

182. **Piper tabanicidum** Trel., sp. nov.

A shrub; twigs sparsely and transiently pale-villous, green-granular; leaves elliptic, acuminate, slightly inequilaterally obtuse at base, 4.5 to 7.5×15 to 16, or 9×21 cm., pinnately nerved from the lower half, the nerves pale, about 5×2, upcurved-pubescent beneath, deep glossy green; petiole about 10+2 mm. long, subhirsute, green-granular, winged at base; spikes 3 to 4×40 to 50 mm.; peduncle 5 to 10 mm. long, glabrous; bracts concave-inflexed; berries depressed-globose, velvety; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,307,383, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45676).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44241, 44287, 44996, 46122, 46145, 46248, 46360, 46593. Líbano, Guanacaste, *Standley & Valerio* 44896, 44925.

"Fruit used formerly to kill maggots in wounds of horses and cattle."

183. **Piper barbulatum** C. DC. Candollea 1: 124. 1923; Schroeder, Candollea 3: 135. 1926.

Piper hostmannianum Auct., as to Costa Rica.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13697, the type).

RANGE: Pacific lowlands of northern Costa Rica (and Nicaragua?).

COSTA RICA: With the type, *Tonduz* 13964.

184. **Piper umbricola** C. DC. Bull. Soc. Bot. Belg. 30[1]: 215. 1891.

TYPE LOCALITY: Rodeo de Pacaca, Costa Rica (*Pittier* 3238, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Tonduz* 4900. Térraba, *Pittier* 3594. San Ramón, *Tonduz* 17780.

185. **Piper disparipes** Trel., sp. nov.

A shrub, glabrous except for the minutely puberulent nerves beneath; twigs pale-granular; leaves subelliptic-oblong, acuminate, the narrowed base inequilaterally subacute, 6 to 7×16 to 20 cm., pinnately nerved from below the middle, the nerves about 5×2, drying rather thin and yellowish; petiole 5+3

to 8+5 mm. long, pale-granular, scarcely winged; spikes 3×90 mm.; peduncle 5 mm. long; bracts roundish-subpeltate, ciliolate; berries cubic; stigmas 2, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,327, collected at El Silencio, Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44766).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Naranjos Agrios, Tilarán, *Standley & Valerio* 46406.

186. Piper papulatum Trel., sp. nov.

A shrub, glabrous except for the obscurely rough-puberulent nerves beneath; twigs white-papillate; leaves subovate-elliptic, gradually acuminate, inequilaterally rounded at base, 4 to 5×13 to 9×20 cm., pinnately nerved from the lower half, the nerves 4 or 5×2, drying thin; petiole 6+4 mm. long, closely white-papillate, winged at base; spikes 3×75 mm., blunt; peduncle 5 mm. long; bracts roundish-subpeltate.

Type in the U. S. National Herbarium, no. 1,229,493, collected at Capulín, Río Grande de Tárcoles, Province of Alajuela, Costa Rica, altitude 80 meters, April 2, 1924, by Paul C. Standley (no. 40181).

RANGE: Pacific lowlands of Costa Rica.

187. Piper imparipes Trel., sp. nov.

A shrub, somewhat puberulent on the axes and the nerves beneath; twigs green-dotted; leaves suboblong-elliptic, acuminate, inequilaterally subacute at base, 6 to 7×16 to 18 cm., pinnately nerved from the lower half, the nerves about 5+4, drying glossy and rather thin; petiole 7+5 mm. long, winged at base; spikes 3×75 mm., obtuse, pale green; peduncle 5 mm. long; bracts roundish- or triangular-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,673, collected at La Verbena, Province of San José, Costa Rica, altitude 1,200 meters, January 29, 1924, by Paul C. Standley (no. 32244).

RANGE: High central divide of Costa Rica.

188. Piper leptocladum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.

Piper dilatatum leptocladum C. DC. Candollea 1: 96. 1923.

TYPE LOCALITY: Río Tuis, Costa Rica (*Pittier* 8160, the type).

RANGE: Reventazón Valley, Costa Rica.

189. Piper pubens Trel., sp. nov.

A shrub; twigs evanescently appressed-soft-hairy, finely pale-granular; leaves lance- or ovate-elliptic, long-acuminate, obliquely subacute at base, 5 to 6.5×15 cm., pinnately nerved from the lower half, the nerves about 5×2, finely granular but scarcely roughened above, paler beneath, with the nerves coarsely appressed-hispid, drying thin and microscopically punctulate; petiole 10 or 15+2 mm. long, transiently crisp-hairy, winged at base; spikes (young) 2×65 mm., slender-mucronate; peduncle slender, 10 mm. long, glabrate; bracts round-subpeltate, glabrous.

Type in the U. S. National Herbarium, no. 1,229,473, collected at La Estrella, Province of Cartago, Costa Rica, March 26, 1924, by Paul C. Standley (no. 39329).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: With the type, *Standley* 39197.

190. Piper subdivaricatum Trel., sp. nov.

A shrub; twigs thinly upcurved-hirsute, pale-granular; leaves lanceolate, attenuate, inequilaterally obtuse at base, 4 to 4.5×13 to 15 cm., pinnately nerved from below the middle, the nerves about 6+5, sparsely appressed-hispid on the

nerves beneath and glandular-punctulate between them; petiole scarcely 3+2 mm. long, subhirsute, becoming pale-granular, winged at base; spikes (young) 2×25 mm., short-peduncled; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,710, collected at La Hondura, Province of San José, Costa Rica, altitude 1,500 meters, March 2-4, 1924, by Paul C. Standley (no. 36489).

RANGE: High central divide of Costa Rica.

191. Piper rotundibaccum Trel., sp. nov.

A shrub; twigs retrorsely crisp-pubescent, becoming finely pale-granular; leaves lanceolate, gradually long-acuminate, inequilaterally obtuse at base, 3.5 to 4.5×10 to 13 cm., obscurely subrugose, pinnately nerved from the lower half, the nerves about 4×2, appressed-hirsute beneath; petiole scant 5 mm. long, hispid or granular, not winged; spikes slender-mucronate, in fruit 5×50 to 60 mm.; peduncle 15 mm. long, hirtellous; bracts triangular-subpeltate, ciliate-lacerate; berries rather large, globose, umbilicate; stigmas 2, sessile.

Type in the U. S. National Herbarium, no. 1,307,279, collected at Quebradillas, Santa María de Dota, Province of San José, Costa Rica, altitude 1,800 meters, December 24, 1925, by Paul C. Standley (no. 42902).

RANGE: High central divide of Costa Rica.

COSTA RICA: Near Santa María de Dota, *Standley* 42891. San Pedro Montes de Oca to Curridabat, *Standley* 41285.

191a. Piper rotundibaccum fraijanesanum Trel., var. nov.

Leaves becoming subovate, variable at base and sometimes cordulate; berries scarcely umbonate.

Type in the U. S. National Herbarium, no. 1,307,511, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,600 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47669).

RANGE: High central divide of Costa Rica.

COSTA RICA: About Fraijanes, *Standley & Torres* 47521, 47543, 47569.

192. Piper zonulatispicum Trel., sp. nov.

A shrub; twigs slender, transiently retrorsely appressed-hispid, becoming pale-granular; leaves lanceolate, gradually long-acuminate, unequally rounded at base, 3.5 to 4.5×11 to 14 cm., pinnately nerved from below the middle (nerves about 4×2), somewhat rugose in age, paler beneath, with the nerves appressed-hispid; petiole 5+2 mm. long, appressed-scabrid, not winged above the base; spikes 2×55 mm., pointed, conspicuously pale-banded by the rounded-subpeltate ciliolate bracts; peduncle 10 to 15 mm. long, glabrous; ovary subglobose-truncate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,636, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51116).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: With the type, *Standley* 33641; *Standley & Valerio* 51335. Orosi, *Standley* 39812, 39893.

193. Piper ejuncidum Trel., sp. nov.

A slender shrub; twigs retrorse-hirtellous, more hairy beneath the nodes; leaves lanceolate, long-attenuate, inequilaterally obtuse at base or semicordulate, 2.5 to 3.5×9 to 12 cm., pinnately nerved from below the middle, the nerves about 5×2, crisp-pubescent beneath; petiole 8 or 10+2 mm. long, crisp-hispid, not winged; spikes 2×30 mm.; peduncle filiform, 20 mm. long, crisp-hirtellous; bracts roundish-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 1,307,670, collected on the Cerro de las Caricias, above San Isidro, Province of Heredia, Costa Rica, altitude

2,300 meters, March 11, 1926, by Paul C. Standley and Juvenal Valerio (no. 52220).

RANGE: High central divide of Costa Rica.

COSTA RICA: Above San Isidro, *Standley & Valerio* 49773, 49784, 49863, 50260, 52095. Santa María de Dota, *Standley* 42391.

194. Piper dotanum Trel., sp. nov.

A slender, spreading or subscandent, glabrous, pale-granular shrub; leaves lance-oblong, long-attenuate, somewhat unequally rounded at base, 2.5 to 3×8 to 11 cm., pinnately nerved from below the middle, the nerves about 4×2, dark green; petiole 3 mm. long, not winged; spikes 3×50 mm., blunt-mucronate; peduncle 10 mm. long; bracts roundish-subpeltate, glabrous.

Type in the U. S. National Herbarium, no. 1,307,252, collected at Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1926, by Paul C. Standley (no. 41739).

RANGE: High central divide of Costa Rica.

COSTA RICA: With the type, *Standley* 41849.

195. Piper pseudo-albuginiferum Trel., sp. nov.

A delicate shrub; twigs transiently and sparsely crisp-pubescent; leaves lanceolate, long-acuminate, unequally rounded at base or subcordulate, 3 to 5×11 to 13 cm., pinnately nerved from below the middle, the nerves 4×2 and subappressed-pubescent beneath; petiole 5+3 mm. long, somewhat crisp-pubescent, not winged; spikes (young) 2×30 mm., blunt, mucronate; peduncle 5 mm. long, glabrate; bracts transversely subpeltate, ciliolate, snowy on the back.

Type in the U. S. National Herbarium, no. 1,307,605, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 50948).

RANGE: Upper Reventazón Valley, Costa Rica.

196. Piper verruculigerum Trel., sp. nov.

An essentially glabrous, slender, white-granular shrub; leaves lanceolate or elliptic-lanceolate, sharply and falcately long-acuminate, unequally rounded at base, 4 to 5×10 to 15 cm., pinnately nerved from below the middle, the nerves 5+4; petiole 5 mm. long, winged below; spikes scarcely 2×50 mm.; peduncle becoming 15 mm. long; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,440, collected at Quebrada Serena, Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46239).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio*, 44487, 45043, 45212, 45549, 45679, 45711, 45724, 45940, 46188, ?46217, 46233, 46420, 46458.

197. Piper verruculosum C. DC. Journ. Bot. Brit. & For. 4: 215. 1866.

Piper nudicaule C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Hoffmann* 8, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Tablazo, *Tonduz* 7922, the type of *P. nudicaule*. Páramo del Abejonal, *Tonduz* 7815.

198. Piper carpinteranum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.

TYPE LOCALITY: Cerro de la Carpintera, Costa Rica (*Pittier & Tonduz* 4348, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 34427, 35551, 35669, 35571. El Muñeco, Río Navarro, Cartago, *Standley* 33629. Alto de la Estrella, Cartago, *Standley* 39309.

199. **Piper silvivagum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.
TYPE LOCALITY: Boca del Río Zhorquín, Costa Rica (*Tonduz* 8595, the type).
RANGE: Caribbean lowlands of Costa Rica.
COSTA RICA: Shirores, *Tonduz* 9272. Tuis, *Tonduz* 11518.

200. **Piper reptabundum** C. DC. Bot. Gaz. 70: 169. 1920.
TYPE LOCALITY: Shirores, Talamanca, Costa Rica (*Tonduz* 9277, the type).
RANGE: Caribbean lowlands of Costa Rica.

201. **Piper flavirameum** C. DC. Bot. Gaz. 70: 181. 1920.
TYPE LOCALITY: La Palma, Costa Rica (*Pittier* 12510, the type).
RANGE: High central divide of Costa Rica.

202. **Piper pilibaccum** C. DC. Bot. Gaz. 70: 179. 1920.
TYPE LOCALITY: Matambú, Nicoya Peninsula, Costa Rica (*Cook & Doyle* 702, the type).
RANGE: Pacific lowlands of northwestern Costa Rica.

203. **Piper urophyllum** C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 170. 1897.
Piper sarapiquinum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 166. 1897.
TYPE LOCALITY: Río Tuis, Costa Rica (*Tonduz* 8159, the type).
RANGE: Caribbean slope of Costa Rica.
COSTA RICA: Tuis, *Tonduz* 11524. Cartago, *Polakowsky* 385. Río de las Vueltas, *Tonduz* 12764. Tsaki, *Tonduz* 9537. Talamanca, *Tonduz* 9284. Shirores, *Tonduz* 9266, 9276; *Pittier* 8275. Río Sarapiquí, *Biolley* 7437, type of *P. sarapiquinum*. Matina, *Pittier* 9742. Finca Montecristo, *Standley & Valerio* 48552. Siquirres, *Pittier* 3189.

204. **Piper catacryptum** Trel., sp. nov.
Differs from *P. urophyllum* in its firmer, relatively broader leaves.
Type in the U. S. National Herbarium, no. 38,069, collected at Rodeo de Pacaca, Costa Rica, January 12, 1891, by H. Pittier (no. 3293).
RANGE: Pacific slope of Costa Rica.
COSTA RICA: Rodeo de Pacaca, *Pittier* 3266. El Arenal, *Standley & Valerio* 45224, 45266. Tilarán, *Standley & Valerio* 44305, 45704, 46645. La Tejona, *Standley & Valerio* 45818, 45858, 45913. El Silencio, *Standley & Valerio* 44594. Naranjos Agrios, *Standley & Valerio* 46422, 46491, 46530 with parasitized (?) spike 5 mm. thick, as also in no. 45858.

205. **Piper tractifolium** Trel., sp. nov.
A glabrous shrub; leaves lance-elliptic, acuminate, equilaterally acute at base, 3 to 4×7 to 11 cm., pinnately nerved from below the middle, the nerves 4×2, drying firm, dark green and glossy above, pale and somewhat glandular-granular beneath; petiole 10 mm. long, not winged; spikes 3×35 mm., mucronate; peduncle filiform, 10 mm. long; bracts triangular- or lunulate-subpeltate, ciliate-lacerate; berries depressed-globose; stigmas 3, large, sessile.
Type in the U. S. National Herbarium, no. 1,307,663, collected on the Cerro de las Caricias, above San Isidro, Province of Heredia, Costa Rica, altitude 2,200 meters, March 11, 1926, by Paul C. Standley and Juvenal Valerio (no. 52052).
RANGE: High central divide of Costa Rica.
COSTA RICA: Vicinity of San Isidro, *Standley & Valerio* 49918, 49952, 51945, 51957; 49122, 50064, with subobovate-lanceolate leaves.

205a. **Piper tractifolium pubescens** Trel., var. nov.
A form with thinner leaves 4×12 cm., the nerves beneath and the young axes sparsely crisp-pubescent.

Type in the Botanical Garden Herbarium, Brussels, collected at La Palma, Costa Rica, by H. Pittier (no. 736).

RANGE: High central divide of Costa Rica.

206. Piper concinnifolium Trel., sp. nov.

Piper concinnum Auct., as to Costa Rica.

Piper mombachanum Auct., as to Costa Rica.

A glabrous shrub; leaves lanceolate or lance-elliptic, acuminate, subequilaterally acute at base, 3 to 4.5×8 to 11 cm., pinnately nerved from far below the middle, the long-ascending nerves 2×2, with shorter nerves up to the upper fourth of the midrib, drying thin and veiny; petiole slender, 10 mm. long, not winged; spikes 1 to 2×40 mm.; peduncle 5 mm. long; bracts inconspicuous, concave, subciliolate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 716,434, collected in the Colinas de Piedades, San Ramón, Costa Rica, altitude 1,100 meters, June 4, 1901, by A. M. Brenes (no. 14194).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About San Ramón, *Brenes*, 17765, 17769, 17782, 17783, 17784. Madregal de San Mateo, ? *Jiménez* 1073. Los Ayotes, Tilarán, Guanacaste, *Standley & Valerio* 45478.

207. Piper elliptico-lanceolatum (C. DC.) Trel.

Piper aequale elliptico-lanceolatum C. DC. Bot. Gaz. 70: 171. 1920.

TYPE LOCALITY: Colinas de Piedades, San Ramón, Costa Rica (*Brenes* [not *Pittier*] 14185, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Brenes* 14186, 14482. Cabagra, *Pittier* 6530. Cañas Gordas, ? *Pittier* 11202. Colinas de Chirripó, ? *Tonduz* 14655.

208. Piper diquisanum C. DC. Bot. Gaz. 70: 185. 1920.

TYPE LOCALITY: Headwaters of the Río Diquís, Costa Rica (*Pittier* 10567, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: With the type, *Pittier* 10599.

209. Piper tenuispicum C. DC. Bot. Gaz. 70: 170. 1920.

TYPE LOCALITY: Trejos, Las Vueltas, Tucurrique, Costa Rica (*Tonduz* 13187, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Juan Viñas, *Cook & Doyle* 294, 295.

210. Piper leptoneuron C. DC. Bot. Gaz. 70: 184. 1920.

TYPE LOCALITY: Santa Clara, Las Delicias, Costa Rica (*Pittier* 10675, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37338. La Colombiana Farm, *Standley* 36740, 36756.

211. Piper xanthostachyum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 169. 1897.

TYPE LOCALITY: Río Tuis, Costa Rica (*Tonduz* 8158, the type).

RANGE: Caribbean slope of Costa Rica.

212. Piper stenocladum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 162. 1897.

TYPE LOCALITY: Boruca, Costa Rica (*Tonduz* 6747 in part, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Valley of El General, ? *Tonduz* 3390.

213. Piper stenocladophorum Trel., sp. nov.

A shrub, glabrous except for the puberulent nerves beneath; leaves lanceolate-suboblong, acuminate, acute at base, 5 to 5.5×15 to 17 cm., pinnately nerved from the lower half, the nerves 4×2; petiole 10 mm. long, not winged; spikes 3×85 mm.; berries round, umbilicate.

Type in the Botanical Garden Herbarium, Brussels, collected at Turrialba by A. Tonduz (no. 8316).

RANGE: Reventazón Valley, Costa Rica.

214. Piper costaricense C. DC. in DC. Prodr. 16 [1]: 328. 1869.

TYPE LOCALITY: Aguacate, Costa Rica (*Hoffmann* 678, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Volcán de Poás, *Pittier* 2958; *Tonduz* 10795. Río Poás, *Pittier* 2387. Turrialba, ? *Tonduz* 41112. Río Ciruelas, *Tonduz* 2204. Las Cóncavas, ? *Lankester* K5.

215. Piper heptaneurum Trel., sp. nov.

A nodose glabrous shrub; leaves lance-oblong, caudate, acute-based, 4×12 cm., firm and glossy, pinnately 7 nerved from the lower third; spikes (young) 2×25 mm.

Type in the U. S. National Herbarium, no. 796,288, collected at Turrialba, Costa Rica, altitude 200 meters, May 6, 1891, by A. Tonduz (no. 4112).

RANGE: Reventazón Valley, Costa Rica.

216. Piper pablense Trel., sp. nov.

A glabrous shrub; leaves lance- or subrhombic-ovate, acuminate, subcuneate, 4 to 5×8 to 10 cm., subpinnately nerved from below the middle, the nerves about 3×2, drying thin; petiole 10 mm. long, slender, not winged; spikes (young) 2×30 mm.; peduncle filiform, 5 mm. long; bracts rounded-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,080,653, collected at San Pablo de Tarrazú, Costa Rica, March, 1918, by Otón Jiménez (no. 1094).

RANGE: Pacific slope of Costa Rica.

217. Piper carnosicaule Trel., sp. nov.

A glabrous shrub; twigs drying very sulcate; leaves subelliptic, long-acuminate, inequilaterally acute at base, 3.5 to 4.5×9 to 12 cm., pinnately nerved from below the middle, the nerves 5+4; petiole 5+2 mm. long, succulent, not winged; spikes 2×55 mm., obtuse; peduncle scant 10 mm. long, succulent; bracts lunulate, inconspicuous; berries oblong-trigonous; stigmas 3, linear, sessile, deciduous.

Type in the U. S. National Herbarium, no. 1,307,625, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51050).

RANGE: Upper Reventazón Valley, Costa Rica.

218. Piper coarctatum Trel., sp. nov.

A glabrous shrub; leaves lance-elliptic, attenuate, nearly equilaterally acute at base, 2.5 to 4×7 to 12 cm., submultiple-nerved from the lower third, the nerves 3×2, drying green and coriaceous; petiole 5 mm. long, grooved but scarcely winged; spikes 3×90 mm.; peduncle 5 to 7 mm. long; berries subglobose, protruding, subpapillate.

Type in the U. S. National Herbarium, no. 1,229,688, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33578).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cervantes, Cartago, *Nogueira* 11031.

219. Piper tuisanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 163. 1897.

TYPE LOCALITY: Río Tuis, Costa Rica (*Pittier* 8073, the type.)

RANGE: Caribbean slope of Costa Rica.

220. Piper striatum C. DC. Linnaea **37**: 345. 1872.

Piper littorale C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 165. 1897.

TYPE LOCALITY: "Nicaragua ad flumen San José et ad Ar. Gramara," Granada (*Oersted* 896, the type).

RANGE: Caribbean boundary region between Costa Rica and Nicaragua.

COSTA RICA: Puerto Viejo, Talamanca, *Tonduz* 8736, type of *P. littorale*. Boca Banana, *Tonduz* 9130. Limón, *Tonduz* 9794; *Pittier* 3643; *Cook & Doyle* 438.

221. Piper guacimonum (C. DC.) Trel.

Piper sepium guacimonum C. DC. Bot. Gaz. **70**: 179. 1920.

A shrub; twigs short-jointed, transiently puberulent; leaves elliptic, the lower ovate or suborbicular, rounded at base, 3.5 to 6×6.5 to 10.5 cm., pinnately or submultiple-nerved from below about the middle, the pale nerves 4 or 5×2, somewhat hirsute on the nerves beneath and dark-punctulate between them; petiole 10 to 20 mm. long, sparsely crisp-hairy, winged to or beyond the middle; inflorescence unknown.

Type in the herbarium of the Botanical Garden, Berlin, collected at Guácimo, Costa Rica, by A. Tonduz (no. 14656).

RANGE: Caribbean lowlands of Costa Rica.

222. Piper poasanum C. DC. Bull. Soc. Bot. Belg. **30**[1]: 206. 1891.

TYPE LOCALITY: Volcán de Poás (*Pittier* 2386, the type).

RANGE: High mountains of central Costa Rica.

COSTA RICA: Volcán de Poás, *Pittier* 247. Las Nubes, *Standley* 38556, 38870. La Estrella, Cartago, *Standley* 39175, 39364.

223. Piper silvanorum Trel., sp. nov.

A soft-wooded shrub; twigs very evanescently and sparingly hairy, pale-granular; leaves ovate, subacuminately attenuate, rounded or exceptionally subacute at base, 6 to 8×11 to 15, or becoming 11×20 cm., pinnately nerved from the lower half, the nerves 5×2, appressed-pubescent on the nerves beneath and somewhat granular between them, somewhat succulent; petiole 15 to 20 or 30 mm. long, thinly subvillous but glabrescent, winged to the middle; spikes 4 to 5×50 to 60 mm., mucronate; peduncle 15 to 20 mm. long, glabrous; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,454, collected in wet forest at Las Nubes, Province of San José, Costa Rica, altitude 1,500 to 1,900 meters, March 21, 1924, by Paul C. Standley (no. 38500).

RANGE: High mountains of central Costa Rica.

COSTA RICA: Above San Isidro, Heredia, *Standley & Valerio* 49917, 50026, 50043, 51562, 52116, 52230.

224. Piper linearifolium C. DC. Linnaea **37**: 355. 1872.

Piper lineatum Auct., as to Costa Rica.

Piper persicariaefolium Auct., as to Costa Rica.

TYPE LOCALITY: Hacienda Santa Rosa, Guanacaste, Costa Rica (*Oersted* 868, the type).

RANGE: Central Costa Rica.

COSTA RICA: Uzarrás, *Oersted* 835. Punta Mala, *Tonduz* 6787. Río Ceibo, *Tonduz* 3612, 4896. Río Corozal, Santo Domingo de Golfo Dulce, *Tonduz* 9931 (J. D. Smith 7136). La Hondura, *Standley* 36171, 37562. Pejivalle, *Standley & Valerio* 46836. Turrialba, *Tonduz* 4104, 8410. Juan Viñas, *Tonduz* 1848; *Cook*

& Doyle 305, 312. Río Tuis, *Tonduz* 8162, 11529. Las Vueltas, Tucurrique, *Tonduz* 12817. Shirores, *Tonduz* 9279. Carrillo Road, *Biolley* 3179. Carrillo, *Cooper* 559; *Pittier* 1193. Río Zent, *United Fruit Co.* 347. Siquirres, *Carleton* 400.

225. Piper pseudo-lanceaefolium Trel., sp. nov.

Piper lanceaefolium Auct., as to Costa Rica.

A shrub; twigs sparsely villous or glabrescent; leaves somewhat inequilaterally lanceolate, sharply long-acuminate, acute-based or with one side obtuse or subcordulate, 5×13 to 16 cm., subpinnately nerved from the lower half, the impressed nerves 7 or 8×2, approximate downward, rugose or veiny, somewhat appressed-pubescent or the upper side glabrous; petiole 5+2 mm. long, pubescent, winged; spikes 3×125 to 150 mm., curved; peduncle slender, 20 to 30 mm. long, glabrate; bracts triangular-subpeltate, ciliate; berries obpyramidal-trigonous, small; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 798,273, collected at La Palma, Costa Rica, altitude 1,450 meters, September, 1898, by A. Tonduz (no. 12665).

RANGE: High central divide of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley* 41822; *Standley & Valerio* 43481. Cerro de la Carpintera, *Standley* 35479. La Estrella, *Standley* 39239. Cerro de las Lajas, Heredia, *Standley & Valerio* 51410. Cerro de Zurquí, Heredia, *Standley & Valerio* 48046, 50622. Vara Blanca, between Volcán de Poás and Barba, *Maxon & Harvey* 8375. Río Poás, *Pittier* 2388.

226. Piper celtidifolium H. B. K. Nov. Gen. & Sp. 1: 50. 1815.

Piper aduncum Auct., as to Costa Rica.

Piper angustifolium Auct., as to Costa Rica.

? *Piper confusum* Auct., as to Costa Rica.

Piper elongatum Auct., as to Costa Rica.

TYPE LOCALITY: Caripe to Cumanacoa, Venezuela (*Bonpland*, in Herb. Willdenow, no. 664, the type).

RANGE: The Guianas, coastwise to Panama and Nicaragua, chiefly on the Caribbean side of the Continent.

COSTA RICA: Without locality, *Endres* 193. Boca Banana, *Tonduz* 9131. Boruca, *Tonduz* 3610, 4492, 6837. Buenos Aires, *Pittier* 3603; *Tonduz* 4897. Cañas Gordas, *Pittier* 11038. Carmen, *Standley & Valerio* 48393. Carrillo Road, *Tonduz* 2524. Cartago, *Oersted* 814. Curridabat, *Standley* 41276. Echeverría, *Pittier* 2548. Escasú, *Standley* 32362. Juan Viñas, *Cook & Doyle* 293; *Tonduz* 1858; ? *Pittier* 3187. La Carpintera, *Standley* 34517, 35773. Las Cóncavas, *Lankester* K312. La Colombiana Farm, *Standley* 36643. La Verbena, *Standley* 32300; *Tonduz* 8868. Las Pavas, *Pittier* 3185. Las Vueltas, Tucurrique, *Tonduz* 12748 (J. D. Smith 7562). Pejivalle, *Standley & Valerio* 46803, 46835, 46837. Peralta, *Stevens* 349. Piedra Blanca road, *Tonduz* 92b. Río Birrís, *Pittier* 3190. Río María Aguilar, *Standley* 38939. Río Naranjo, *Tonduz* 7534. Rodeo de Pacaca, *Pittier* 1589, 3280; *Tonduz* 1595. San Francisco de Guadalupe, *Tonduz* 1773, 7132, 8021, 17953. San José, *Pittier* 3025; *Standley* 33248, 34820, 47356; *Tonduz* 780 (J. D. Smith 7299), 3024. San Pedro Montes de Oca to Curridabat, *Standley* 41276. San Sebastián, *Standley* 32700. Santo Domingo de Golfo Dulce, *Tonduz* 9970 (J. D. Smith 7141). Tres Ríos, *Pittier* 92. Tuis *Tonduz* 11528 (J. D. Smith 7336). Shirores, *Tonduz* 9267. Zapote, *Standley* 40236.

227. Piper disparispicum Trel., sp. nov.

A shrub; twigs gray-hirsute; leaves lance-oblong, gradually pointed rather than acuminate, inequilaterally cordulate, 6×19 cm., scabrid, the nerves beneath upcurved-hirsute; peduncle 15 mm. long.

Type in the U. S. National Herbarium, no. 1,229,336, collected at Escasú, Province of San José, Costa Rica, altitude 1,250 meters, January 29, 1924, by Paul C. Standley (no. 32319).

RANGE: High central divide of Costa Rica.

228. Piper aduncifolium Trel., sp. nov.

Piper hirsutum subsessilifolium Auct., as to Costa Rica.

Piper hispidum olfersianum Auct., as to Costa Rica.

A shrub; twigs subretrorsely hispid; leaves broadly elliptic-suboblong, acuminate, subequilaterally rounded at base or somewhat cordulate, 5 to 7.5×14 to 16 cm., pinnately nerved from the lower half, the nerves about 7×2, gradually approximate downward, granular-scabrous above and somewhat hispid on the nerves, loosely silky beneath with upcurved-pubescent nerves; petiole 5 mm. long, hispid, not winged; spikes 3×115 mm., either straight or arcuate; peduncle 10 mm. long, hispid; bracts transversely subpeltate.

Type in the U. S. National Herbarium, no. 796,393, collected at Carrillo, Costa Rica, altitude 300 meters, September 8, 1889, by H. Pittier (no. 1196).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Carrillo Road, *Tonduz* 2532. Santa Clara, Las Delicias, *Biolley* 10671.

229. Piper cartagoanum C. DC. Linnaea 37: 350. 1872.

TYPE LOCALITY: Cartago, Costa Rica (*Oersted* 829, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

230. Piper sepicola C. DC. Bull. Soc. Bot. Belg. 30[1]: 202. 1891.

TYPE LOCALITY: Turrialba, Costa Rica (*Tonduz* 4114, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

231. Piper gonagricum Trel., sp. nov.

A shrub; twigs glabrescent and pale-granular; leaves ovate or lance-ovate, acuminate, equilaterally or obliquely obtuse at base, 4 to 5×9 to 10 cm., pinnately nerved from the lower half, granular-scabrous above, the nerves about 5×2, hirsute beneath; petiole 5 or 4+4 mm. long, sparsely hirsute, becoming somewhat granular; spikes 3 to 4×50 to 85 mm.; peduncle 5 to 10 mm. long, glabrate; bracts rounded-subpeltate, ciliolate; berries subcylindric, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Harbarium, no. 1,307,566, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1928, by Paul C. Standley and Juvenal Valerio (no. 49082).

RANGE: High central divide of Costa Rica.

COSTA RICA: Cerro de Zurquí, San Isidro, *Standley & Valerio* 50261. El Tablazo, *Tonduz* 7921. Zurquí, *Standley & Valerio* 48028, 48142.

232. Piper pejivallense Trel., sp. nov.

A shrub; twigs hispid; leaves subelliptic-ovate, acuminate, inequilateral at base with the shorter side acute, 4 to 5×9.5 to 10.5 cm., pinnately nerved from the lower half, microscopically granular above and lepidote, the nerves about 5+4, pale-hirsute beneath; petiole 5 to 10 mm. long, not winged, hirtellous or hispid; spikes 3×70 mm.; peduncle 5 to 10 mm. long, hirtellous; bracts subtriangular-subpeltate, ciliate; berries oblong, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,472, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 46727).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Pejivalle, *Standley & Valerio* 47070.

233. Piper curvipilum Trel.

Piper hirsutum pallescens C. DC. Bull. Soc. Bot. Belg. 30[1]: 204. 1891.

TYPE LOCALITY: Aguacaliente, Costa Rica (*Tonduz* 2530, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Tuis, *Tonduz* 8163, 11527 (J. D. Smith 7335). Las Vueltas, *Tonduz* 12781, 13126. Aragón, *Tonduz* 9013. Suerre, Santa Clara, *J. D. Smith* 6750. Cuesta de La Vieja, *Cook & Doyle* ? 108, 109.

234. Piper pergeniculatum Trel., sp. nov.

A nodose shrub; twigs zig-zag, dingy-hispid; leaves elliptic-oblong, acuminate, subequilaterally acute at base, 6× 15 to 16 cm., pinnately nerved from the lower half, the nerves about 6×2, scabrous above, softly appressed-pubescent beneath; petiole 10 mm. long, hispid, not winged; spikes 3×70 mm.; peduncle 10 mm. long, hispid; bracts round- or transversely subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 798,238, collected at Cañas Gordas, Costa Rica, altitude 1,100 meters, February, 1897, by H. Pittier (no. 11033).

RANGE: Caribbean slope of eastern Costa Rica.

235. Piper genuflexum Trel., sp. nov.

A shrub; twigs zig-zag, white villous-hirsute; leaves elliptic-oblong, acuminate, nearly equilaterally acute at base, 4 to 6×13 to 16 cm., pinnately nerved from the lower half (nerves about 5×2), white-scabrous above, the nerves hispid on both sides; petiole scarcely 10 mm. long, hispid, not winged; spikes 3×75 mm.; peduncle 5 mm. long, subhispid; bracts lunulate-subpeltate, white-ciliate.

Type in the U. S. National Herbarium, no. 796,263, collected at Santa Rosa del Copey, Costa Rica, altitude 1,800 meters, February, 1928, by A. Tonduz (no. 11687).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: La Uruca, ? *Tonduz* 6354.

236. Piper echeverrianum Trel., sp. nov.

Piper hirsutum magnifolium Auct., as to western Costa Rica.

A shrub; twigs retrorsely hispid; leaves elliptic, acuminate, inequilaterally acute at base, 6 to 7.5 × 13 to 15 cm., pinnately nerved from the lower half (the nerves about 6+5), granular-scabrous and somewhat lepidote above, dark-granular beneath with hispid nerves, becoming rugose; petiole some 10+3 mm. long, sparsely hirsute, not winged; spikes about 3×80 to 150 mm.; peduncle 5 to 10 mm. long, glabrate; bracts round-subpeltate, dingy-ciliolate; berries oblong, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,295, collected at Echeverría, Costa Rica, May, 1890, by H. Pittier (no. 2547).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El General, *Pittier* 3387, 3388, 3394. San Ramón, *Brenes* 14195; *Tonduz* 17774. Buenos Aires, *Pittier* 3607 in part, 4895, 4903. Alajuela *Alfaro* 498 (J. D. Smith 5919). Térraba, *Tonduz* 3595; *Pittier* 3608. Nicoya, ? *Tonduz* 13691. La Argentina, ? *Jiménez* 1139.

237. Piper reventazonis Trel., sp. nov.

A shrub; twigs subvillous-hirsute; leaves elliptic-subovate, acuminate, obliquely obtuse at base, 5 to 7×11 to 15 cm., pinnately nerved from the lower half, nerves about 5×2, rugose, scabrous above from the bases of long hairs, loosely soft-hirsute beneath; petiole 8+2 mm. long, hirsute; spikes 2×80 to 100 mm.; peduncle 10 mm. long, hispid; bracts lunulate-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 474,115, collected at Juan Viñas, Costa Rica, altitude 1,000 meters, April 25, 1903, by O. F. Cook and C. B. Doyle (no. 306).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Juan Viñas, *Cook & Doyle* 349; *Pittier* 1868, 3187.

238. **Piper pseudofuligineum** C. DC. Linnaea 37: 355. 1872.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Oersted* 887, the type).

RANGE: Central Costa Rica.

239. **Piper bisasperatum** Trel., sp. nov.

A shrub; twigs quickly glabrescent, with intermingled coarse and fine warts; leaves obliquely ovate, acuminate, obtuse at base, 6 to 8×15 cm., pinnately nerved from the lower half, the nerves about 6+5, becoming rugose, granular-roughened, with caducous pubescence, the somewhat punctulate lower side hirsute on the nerves; petiole 12+3 mm. long, subvillous but glabrescent and granular, not winged; spikes 3×60 mm.; peduncle 10 mm. long, minutely roughened; bracts rounded-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 1,229,396, collected on the Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924, by Paul C. Standley (no. 35723).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Pittier & Tonduz* 4349; *Standley* 34272, 35582, 35587, 35692, 35739. San Isidro Coronado, *Alfaro* 34002, 34012. Yerba Buena, above San Isidro, *Standley & Valerio* 49226, 49697, 49714. Cerros de Zurquí, *Standley & Valerio* 50293, 50413. Cerro de las Caricias, *Standley & Valerio* 52002, 52030, 52053, 52110, 52185. El Muñeco, *Standley & Valerio* 51241, 51251. La Estrella, Cartago, ? *Standley* 39219, 39228, 39339.

240. **Piper pavasense** Trel., sp. nov.

A shrub; twigs hispid-hirsute; leaves subelliptic, acuminate, inequilaterally rounded at base, 6 to 9×15 to 16 cm., pinnately nerved from the lower half, the nerves about 6+5, scabrous above from the bases of deciduous appressed hairs, granular beneath and hirsute on the nerves, becoming subrugose; petiole 5+3 mm. long, hirsute, not winged; spikes 3×70 mm.; peduncle 10 mm. long, hispid or subglabrescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,372, collected at Las Pavas, Province of San José, Costa Rica, altitude 900 meters, May, 1890, by H. Pittier (no. 3188).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Las Pavas, *Pittier* 3184, with subvillous pubescence; 3192; 3194, with acute-based leaves 9 to 10.5×19 to 20 cm., the nerves beneath scarcely more than puberulent.

241. **Piper talamancanum** Trel., sp. nov.

Piper hirsutum pallens Auct., p. p.

A shrub; twigs gray-subvillous; leaves inequilaterally lance-elliptic, acuminate, subacute at base, 6 to 8×16 to 18 cm., pinnately nerved from the lower half, the nerves about 6+5, somewhat rugose, scabrous above from the bases of appressed hairs, upcurved-hairy on the nerves beneath; petiole 10 mm. long, white-hairy, not winged; spikes 2 to 3×70 to 80 mm.; peduncle 5 mm. long, hirsute.

Type in the U. S. National Herbarium, no. 577,234, collected at Shirores, Province of Talamanca, Costa Rica, altitude 100 meters, February, 1895, by A. Tonduz (no. 9274); also sheet no. 796,389.

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Shirores, *Tonduz* 9284. Río Zhorquín, *Tonduz* 8587, 8592. Siquirres, ? *Pittier* 3181.

242. Piper cookii Trel., sp. nov.

A shrub; twigs drying dark, for a time rusty-subvillous; leaves inequilaterally lanceolate, acuminate, the narrowed base subobtuse, 4 to 5×10 to 12 cm., pinnately nerved from the lower half, the nerves about 5+4, granular-scabrous above, paler beneath with appressed-pubescent nerves; petiole 5+2 mm. long, rusty-hirsute, not winged; spikes (young) 2×55 mm.; peduncle 10 mm. long, soft-hairy; bracts rounded-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 474,200, collected at Turrialba, Costa Rica, by O. F. Cook and C. B. Doyle (no. 376).

RANGE: Reventazón Valley, Costa Rica.

243. Piper tsuritkubense Trel., sp. nov.

Piper hirsutum magnifolium Auct., in part as to Costa Rica.

A shrub; twigs hispid-hirsute; leaves obliquely elliptic-ovate, acuminate, rounded or exceptionally acute at base, 6 to 9×13 to 19 cm., pinnately nerved from the lower half or two-thirds, the nerves about 6+5, at most obscurely rugose, white-scabrous above, the nerves beneath hirsute; petiole 5+3 to 10+5 mm. long, hispid-hirsute, not winged; spikes 3×100 mm.; peduncle 10 mm. long, hispid; bracts lunulate-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,368, collected at Tsuritkub, Talamanca, Costa Rica, March, 1894, by A. Tonduz (no. 8616).

RANGE: Lower Caribbean slope of Costa Rica.

COSTA RICA: Tsuritkub, *Tonduz* 8609, 8654, 8718. Puerto Viejo and Sarapiquí River, *Biolley* 6917, acute-based; 7435. Tuis, *Tonduz* 8074, acute-based; 16527. Boca de Zhorquín, *Tonduz* 8587. Las Vueltas, Tucurrique, *Tonduz* 13127. Tsaki, *Tonduz* 9534, 9535. Hacienda de la Estrella, *United Fruit Co.* 184. Río Hondo, Santa Clara, *Cook & Doyle* 486.

244. Piper subquadratum Trel., sp. nov.

A glabrous shrub with pale-granular rooting branches; leaves subquadrately elliptic-ovate, acuminate, obliquely obtuse at base, 5 to 7×12 cm., pinnately nerved from below the middle, the nerves 4 or 5×2, more or less granular and lepidote above; petiole about 5 mm. long; spikes some 2×70 mm.; peduncle scant 5 mm. long.

Type in the U. S. National Herbarium, no. 796,209, collected at Río Ariei, Talamanca, Costa Rica, February, 1895, by A. Tonduz (no. 9387 in part).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9536. Puerto Viejo and Sarapiquí River, *Biolley* 6914. La Palma, ? *Pittier* 12546.

245. Piper machucanum Trel., sp. nov.

A shrub; twigs rusty-subvillous; leaves lance-ovate, acuminate, inequilaterally obtuse or exceptionally acute at base, 7×16 to 9×20 cm., pinnately nerved from the lower half, the nerves about 6+5, scabrous above from the bases of long white hairs, and with soft long hairs beneath, becoming rugose; petiole about 7+3 mm. long, hispid; spikes 2 to 3×60 to 120 or 150 mm.; peduncle 10 mm. long, hispid; bracts rounded-subpeltate.

Type in the Botanical Garden Herbarium, Brussels, collected at San Mateo, on the Río Machuca, Costa Rica, by P. Biolley (no. 4068, "1168").

RANGE: Lower Pacific slope of Costa Rica.

COSTA RICA: Punta Mala, ? *Tonduz* 6784, 6820.

246. Piper laevius (C. DC.) Trel.

Piper hirsutum laevius C. DC. Bull. Soc. Bot. Belg. 30[1]: 204. 1891.

TYPE LOCALITY: Puntarenas, Costa Rica (*Pittier* 496, the type).

RANGE: Pacific coast of Costa Rica.

247. Piper granulatum Trel., sp. nov.

A shrub; twigs retrorsely white-hairy; leaves lanceolate, acuminate, obliquely rounded at base, 3.5 to 4.5×12 cm., pinnately nerved from the lower half, the nerves about 5+4, granular-scabrous above, subappressed-hirsute on the nerves beneath; petiole 10 mm. long, hirsute, not winged; spikes 3×80 to 90 mm.; peduncle scant 10 mm. long, white-hairy; bracts rounded-subpeltate, ciliolate; berries oblong, glabrate; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,264, collected at Buenos Aires, Costa Rica, altitude 250 meters, February, 1891, by H. Pittier (no. 3593).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Buenos Aires, *Tonduz* 4894. Boruca, *Tonduz* 3598, 3614. Santiago, San Ramón, ? *Tonduz* 17768. Quebrada de la Ardilla, San Marcos, *Tonduz* 7556. Cabagra, *Tonduz* 6531.

248. Piper anguillaespicum Trel., sp. nov.

A shrub; twigs glabrous, somewhat pale-granular; leaves elongate-lanceolate, subcaudately pointed, subacute at base, 4×13 cm., pinnately nerved from below the middle, the impressed nerves about 6×2, granular-roughened and at first short-hairy above, appressed-hispid beneath; petiole 5 mm. long, hirtellous and granular, not winged; spikes flexuous, filiform, 2×90 mm., with slender sterile tip; peduncle 15 mm. long, glabrescent and granular; bracts roundish-subpeltate, minute, ciliolate; ovary subglobose, roughened; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,080,176, collected near San Ramón, Costa Rica, altitude 900 to 950 meters, by A. M. Brenes (no. 14197).

RANGE: Pacific slope of Costa Rica.

249. Piper dumeticola C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.

TYPE LOCALITY: Boruca, Costa Rica (*Tonduz* 4490, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Boruca, *Tonduz* 4106, 4107, 4491, 4780. Rodeo de Pacaca, *Pittier* 3297. El Bolsón, Guanacaste, *Pittier* 2611. Los Frailes, *Tonduz* 7876. San Marcos, *Tonduz* 7554, 7761.

250. Piper oblanceolatum Trel., sp. nov.

A shrub; twigs snowy-villous but glabrescent; leaves oblanceolate, acuminate, the narrowed base obliquely rounded, 4.5×15 cm., pinnately nerved from below about the middle, the nerves 6×2, scabrous above, soft-hairy on the nerves beneath with the hairs spreading near the base; petiole 4+2 mm. long, white-villous, not winged; spikes (young) 2×20 mm., on short hairy peduncles; bracts transversely subpeltate, ciliate-lacerate.

Type in the U. S. National Herbarium, no. 1,307,380, collected at Los Ayotes, Tilarán, Province of Guanacaste, Costa Rica, altitude 650 meters, January 21, 1926, by Paul C. Standley and Juvenal Valerio (no. 45558).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Guanacaste, *Pittier* 2611. Rodeo de Pacaca, *Pittier* 3297.

250a. Piper oblanceolatum fragilicaule Trel., var. nov.

Leaves lanceolate, the nerves beneath as well as the petiole appressed-hispid.

Type in the U. S. National Herbarium, no. 1,307,361, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45228).

RANGE: Pacific slope of Costa Rica.

251. Piper comatum Trel.

Piper hirsutum longepilosum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897. Not *P. longepilosum* C. DC.

TYPE LOCALITY: Río Corozal, Santo Domingo de Golfo Dulce, Costa Rica (*Tonduz* 9932, the type).

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Río Corozal, *Tonduz* 7137. Matina, *Pittier* 10309.

252. Piper salinasanum C. DC. Bull. Soc. Bot. Belg. 30[1]: 214. 1891.

TYPE LOCALITY: Salinas Bay, Costa Rica (*Pittier* 2775, the type).

RANGE: Pacific lowlands of northwestern Costa Rica.

COSTA RICA: Nicoya, *Cook & Doyle* 668. Capulín, Río Grande de Tárcoles, *Standley* 40165.

253. Piper griseo-pubens Trel., sp. nov.

A shrub; twigs subcrisply hirtellous, but glabrescent; leaves elliptic-ovate or subobovate, short-acuminate, 6 to 6.5×12 to 13 cm., pinnately nerved from below the middle, the nerves about 6+5, appressed-pubescent above with hard-based soft pale hairs, softly appressed-pubescent beneath; petiole 7+4 mm. long, somewhat crisp-hirtellous, not winged; spikes (very young) 1×10 mm., gray-pubescent.

Type in the U. S. National Herbarium, no. 1,307,328, collected at Líbano, Province of Guanacaste, Costa Rica, altitude 300 meters, January 15, 1926, by Paul C. Standley and Juvenal Valerio (no. 44879).

RANGE: Pacific slope of Costa Rica.

253a. Piper griseo-pubens revocabile Trel., var. nov.

Leaves ovate to subquadrately oblanceolate-obovate, 6 to 8×14 to 18 cm.; spikes 3×50 mm.

Type in the U. S. National Herbarium, no. 1,307,333, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44943).

RANGE: Pacific slope of Costa Rica.

254. Piper leucophlebium Trel., sp. nov.

A shrub; twigs villous-hirsute, but glabrescent and slightly granular; leaves broadly lanceolate, subfalcate-acuminate, inequilaterally obtuse at base, 6 to 7.5×14 to 20 cm., pinnately nerved from the lower half, the pale nerves about 7+6, becoming rugose, scabrous above from the bases of fine long white hairs, softly villous-hirsute beneath; petiole 10 or 12+3 mm. long, upcurved-hairy, not winged; spikes 3×60 to 70 mm.; peduncle 5 mm. long, retrorsely subvillous; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,301, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44277).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 45908, 46596.

255. Piper scalpens Trel., sp. nov.

Piper hirsutum parvifolium Auct., p. p.

A shrub; twigs sparsely gray-hispid, granular-roughened; leaves lanceolate or subelliptic-oblong, acuminate, obliquely rounded or subacute at base, 4×9 to 11 cm., pinnately nerved from the lower half, the nerves 4 or 5×2, very white-scabrous above, minutely punctulate beneath and hispid on the nerves; petiole 5+2 mm. long, hairy, not winged; spikes 3×70 mm.; peduncle 5 mm. long, somewhat hairy; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,405, collected at San José, Province of San José, Costa Rica, altitude 1,100 meters, July, 1896, by A. Tonduz (no. 10154). Also distributed by John Donnell Smith as no. 7312.

RANGE: High central divide of Costa Rica.

256. Piper spicilongum Trel., sp. nov.

A shrub; twigs appressed-hispid; leaves elliptic-ovate or subobovate, acuminate, obliquely obtuse at base, 6 to 11×15 to 19 cm., pinnately nerved from the lower half, the nerves about 6×2, obscurely rugose, granular and lepidote above, the nerves beneath hispid; petiole 10 to 20 mm. long, hispid, not winged; spikes 2 to 3×125 mm.; peduncle about 10 mm. long, hispid; bracts rounded-subpeltate.

Type in the U. S. National Herbarium, no. 796,390 (also represented by no. 796,391), collected at Santo Domingo de Golfo Dulce, Costa Rica, March, 1896, by A. Tonduz (no. 9962). Distributed also by John Donnell Smith as no. 7140.

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Surubres, San Mateo, *Biolley* 1051.

257. Piper trichophlebium Trel.

Piper hirsutum tonduzii C. DC. Bull. Soc. Bot. Belg. 30 [1]: 203. 1891. Not *P. tonduzii* C. DC.

TYPE LOCALITY: Aserrí, Costa Rica (*Tonduz* 1270, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: San Pedro Road, San José, *Tonduz* 1409. La Palma, *Standley* 33094; *Tonduz* 12588. La Palma to La Hondura, *Maxon & Harvey* 7992. La Hondura, *Standley* 36133, 36578. Carrizal, Volcán de Barba, *Pittier* 792. Alajuelita, *Tonduz* 1467. Río Ciruelas, *Tonduz* 2198. San José, *Pittier* 10654. Río María Aguilar, San José, *Standley* 38957. Aguacaliente, *Pittier* 64.

258. Piper caudatifolium Trel., sp. nov.

A shrub; twigs sparsely hispid or subglabrescent and finely pale-granular; leaves lance- or oblong-elliptic, long-acuminate, obliquely rounded at base, 3 to 4×9 to 10 cm., pinnately nerved from the lower half, granular-scabrous, the nerves about 5×2, with spreading rusty hairs beneath; petiole 5+2 mm. long, h spid, not winged; spikes 2 to 3×60 to 80 mm.; peduncle 5 mm. long, glabrate; bracts round-subpeltate, ciliolate; berries oblong, puberulent; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 796,382, collected at Las Pavas, Province of San José, Costa Rica, altitude 800 meters, November, 1890, by H. Pittier (no. 3191).

RANGE: Mountains of central Costa Rica.

259. Piper torresanum Trel., sp. nov.

Piper hirsutum pallescens Auct., p. p.

A shrub; twigs glabrous, scarcely granular; leaves lanceolate, acuminate, rounded or subacute at base, 4 to 6×13 to 15 cm., pinnately nerved from the lower half, the nerves about 5×2, white-scabrous above and somewhat hispid on the nerves, the nerves beneath appressed-gray-pubescent; petiole 5 to 7+3 mm. long, white-hispid, not winged; spikes (young) 3×50 mm.; peduncle 5 mm. long, glabrous; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 796,388, collected on the Río Torres, San Francisco de Guadalupe, Costa Rica, altitude 1,170 meters, November 25, 1894, by A. Tonduz and H. Pittier (no. 8971).

RANGE: High central divide of Costa Rica.

COSTA RICA: Tablazo, ? *Tonduz* 7921.

260. Piper inhorrescens Trel., sp. nov.

A shrub; twigs dingy-subtomentose, pale-granular when denuded; leaves lanceolate, acuminate, inequilaterally rounded at base, 3.5 to 4.5×9 to 13 cm., pinnately nerved from the lower half, the nerves about 6+5, pubescent above with soft hairs but becoming very rough in age from their enlarging granular bases, dingy hirsute-villous beneath; petiole 5+2 to 5 mm. long, crisp-hairy,

not winged; spikes 4×75 mm.; peduncle 10 mm. long, crisp-pubescent; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,707, collected at Las Pavas, Province of San José, Costa Rica, altitude 1,070 meters, February 29, 1924, by Paul C. Standley (no. 36083).

RANGE: High central divide of Costa Rica.

COSTA RICA: Las Pavas, *Standley* 36068. La Verbena, *Standley* 32204.

261. Piper squali-pelliculum Trel., sp. nov.

Piper salinasanum subscabrifolium C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 164. 1897.

Piper salinasanum subscabridifolium C. DC. Candollea 1: 275. 1923. (Name only.)

A shrub; twigs loosely soft-hirsute to subglabrescent and pale-granular; leaves inequilaterally lanceolate, long-attenuate, the longer side somewhat cordulate, 7 to 8×20 cm., pinnately nerved from below the middle, the nerves about 5×2, becoming rugose, shagreen-roughened above from the bases of pointed hairs, the nerves beneath soft-hirsute; petiole about 5+5 mm. long, soft-hirsute, not winged; spikes 3×90 mm.; peduncle 10 mm. long, sparsely soft-hairy and pale-granular; bracts transversely subpeltate, ciliate.

TYPE LOCALITY: Río Virilla, San José (*Tonduz* 10126, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Near San José, *Tonduz* 7300, 12729. La Palma, *Standley* 38216.

262. Piper verbenanum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 165. 1897.

Piper salinasanum verbenanum C. DC. Candollea 1: 97. 1923.

Piper mollicomum Auct., as to Costa Rica.

TYPE LOCALITY: La Verbena, near Alajuelita, San José, Costa Rica (*Tonduz* 8867, the type).

RANGE: High central divide, Costa Rica.

COSTA RICA: La Verbena, *Tonduz* 8869, 8870; *Standley* 32208, 32228, 32294. Cerro de la Carpintera, *Hoffmann* 349.

263. Piper valetudinarii Trel., sp. nov.

A shrub; twigs subretrorsely or crisp-hispid; leaves lance-ovate, acuminate, obliquely rounded at base or subcordulate, 5 to 7×13 to 15 cm., pinnately nerved from the lower half, the nerves about 5×2, white-scabrous above, granular beneath and upcurved-hispid on the nerves, little rugose; petiole scant 7+4 mm. long, hispid, not winged; spikes 3×60 to 70 mm.; peduncle 10 to 15 mm. long, hispid; bracts roundish-subpeltate, ciliate.

Type in the U. S. National Herbarium, no. 471,728, collected near the hospital at San José, Costa Rica, January 2, 1893, by A. Tonduz (no. 7235); also represented by no. 796,362.

RANGE: High central divide of Costa Rica.

264. Piper submolle Trel., sp. nov.

A shrub; twigs rather soft-hairy; leaves lanceolate, gradually attenuate, almost equilaterally rounded at base, 5.5 to 7×17 to 20 cm., pinnately nerved from the lower half, the nerves about 6×2, white-scabrous above from the bases of rather short and soft hairs, the nerves beneath appressed-hairy; petiole 10 mm. long, soft-hairy, not winged; spikes 3×80 mm., zonulate; peduncle 7 mm. long, appressed-pubescent; bracts conspicuous, triangular-subpeltate; berries obconic; stigmas 3, minute, sessile.

Type in the U. S. National Herbarium, no. 1,307,521, collected at Carmen, Province of Limón, Costa Rica, altitude 30 meters, February 20, 1896, by Paul C. Standley and Juvenal Valerio (no. 48363).

RANGE: Caribbean lowlands of Costa Rica.

265. Piper carminis Trel., sp. nov.

A shrub; twigs retrorsely hirsute, pale-granular about the nodes; leaves obliquely broadly elliptic, acuminate, obtuse at base, 4.5 to 7×11 to 14 cm., pinnately nerved from the lower half, the nerves about 5×2, white-granular and with scattered soft hard-based hairs above, appressed-rough-hairy on the nerves beneath; petiole 3 or 5+3 mm. long, upcurved-hirsute, not winged; spikes 2.5×55 mm.; peduncle 5 mm. long, verruculose-hispid; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,522, collected at Carmen, Province of Limón, Costa Rica, altitude 30 meters, February 20, 1926, by Paul C. Standley and Juvenal Valerio (no. 48383).

RANGE: Caribbean lowlands of Costa Rica.

266. Piper coronatibracteum Trel., sp. nov.

A shrub; twigs sparsely upcurved-hirsute; leaves subovate-elliptic, acuminate, inequilaterally obtuse at base, 4.5 to 7×10 to 13 cm., pinnately nerved from the lower half, the nerves about 6+5, roughish appressed-pubescent above with short thick-based hairs, the nerves beneath upcurved-hirsute; petiole scarcely 4+4 mm. long, upcurved-hirsute, not winged; spikes (young) 3×55 mm.; peduncle 10 mm. long, glabrescent; bracts round-subpeltate, brown, with a conspicuous narrow fimbriulate white margin.

Type in the U. S. National Herbarium, no. 1,307,565, collected at Hamburg Finca, Province of Limón, Costa Rica, altitude 55 meters, February 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48844).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48651. Carmen Station, *Standley & Valerio* 48383.

267. Piper subhirsutum Trel., sp. nov.

A shrub; twigs transiently hispid, pale-granular; leaves lance-elliptic, acuminate, inequilaterally obtuse at base, 5×12.5, becoming 8×18 cm., pinnately nerved from the lower half, the nerves about 6+5, granular and very lepidote above, punctulate beneath and with upcurved-hispid nerves; petiole 10+5 mm. long, hispid-hirsute, not winged; spikes 3×100 mm.; peduncle 10 mm. long, hirtellous; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,229,406, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36642).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Limón, *Stevens* 896.

267a. Piper subhirsutum tomentosicaule Trel., var. nov.

Differs in its dingy-subtomentose axes and brown-velvety nerves.

Type in the U. S. National Herbarium, no. 1,229,421, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March, 1924, by Paul C. Standley (no. 36821).

RANGE: With the type.

268. Piper scintillans Trel., sp. nov.

A shrub; twigs retrorsely white-hispid; leaves subelliptic-ovate or subquadrately obovate, acuminate, with the narrowed base inequilateral and acute at least on one side, 8 to 10×18 to 21 cm., pinnately nerved from the lower half, the nerves about 6×2, glistening-punctulate above, microscopically scintillating beneath and with upcurved-hirsute nerves; petiole 5+3 mm. long, upcurved-hirsute, not winged; spikes 3×80 to 100 mm.; peduncle scarcely 10 mm. long, hirtellous; bracts subpeltate.

Type in the U. S. National Herbarium, no. 1,307,564, collected at Hamburg Finca, Province of Limón, Costa Rica, altitude 50 meters, February 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48828).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48401, 48468, 48508, 48554, 48637. La Colombiana Farm, *Standley* 36642, 36707, 36746, 36792, 36814, 36984. Hacienda Parismina, ? *Jiménez* 1042.

269. Piper fusco-granulatum Trel., sp. nov.

A shrub; flowering internodes rather short and moderately stout, brownish-hirsute; leaves elliptic, sharply acuminate, obliquely subcordulate, about 9×18 cm., pinnately nerved from below the middle, the nerves 6×2, becoming slightly rugose, brown-granular and with hirtellous nerves above, softly crisp-pubescent beneath; petiole 10+3 mm. long, hispid, not winged; spikes 3×100 mm.; peduncle 10 mm. long, hispid; bracts rounded-subpeltate, ciliolate; berries oblong; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 861,553, collected at Hacienda de Zent, Costa Rica, by the United Fruit Company (no. 269).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Victoria Farm, near Hacienda de Zent, *Tonduz* 14654.

270. Piper baculiferum Trel., sp. nov.

A shrub; twigs hispid, becoming pale-granular; leaves obliquely subelliptic, somewhat acuminate, inequilaterally obtuse at base, 4.5 to 6×9 to 12 or even 8×16 to 19 cm., pinnately nerved from the lower half, the nerves about 5+4, granular and very lepidote above, minutely granular beneath with subappressed-hirsute nerves; petiole scant 7+3 mm. long, sparsely subhirsute; spikes 2.5 to 3×90 to 115 mm.; peduncle slender, 10 to 25 mm. long, hirtellous and pale-punctulate; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,342, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45052).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Arenal, *Standley & Valerio* 45154, 45192, 45226, 45264. Naranjos Agrios, Guanacaste, *Standley & Valerio* 46462.

271. Piper rectamentum Trel., sp. nov.

A shrub; twigs canescently upcurved-hispid with hard-based hairs; leaves subelliptic, short-acuminate, inequilaterally obtuse or subacute at base, 4.5 to 6×12 to 14 cm., pinnately nerved from the lower half, the nerves about 5×2, granular-scabrid above, white-areolate beneath with the nerves arcuate-hispid; petiole 10 to 15 mm. long, ashen, not winged; spikes 3×110 mm.; peduncle 10 mm. long, gray-hispid; bracts round- or triangular-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,363, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 500 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45237).

RANGE: Pacific slope of Costa Rica.

272. Piper punctiunculatum Trel., sp. nov.

A shrub; twigs scabro-hispid; leaves obliquely elliptic, acuminate, inequilaterally obtuse or subacute at base, 6 to 10×13 to 19 cm., pinnately nerved from the lower half, the nerves about 6+5, microscopically white-punctulate and lepidote above, the nerves subappressed-hispid beneath and the surface punctulate; petiole 8 to 10+2 to 5 mm. long, hispid, brown-granular, not winged; spikes 2.5 to 3×80 to 115 mm.; peduncle about 5 mm. long, glabrescent and granular-roughened; bracts round-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,393, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 600 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 45712).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44975, 45048, 46084. Los Ayotes, *Standley & Valerio* 44725, 45473.

273. Piper emollitum Trel., sp. nov.

A shrub; twigs evanescently pubescent, pale-granular; leaves lance-oblong, acuminate, inequilaterally acute at base, 5 to 7.5×18 to 20 cm., pinnately nerved from below the upper third, the nerves about 6×2, finely granular and lepidote, the nerves beneath appressed-hispid at least upward; petiole 10 mm. long, glabrous, granular; spikes 3×60 to 70 mm.; peduncle 10 mm. long, glabrous, pale-dotted; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,315, collected at El Silencio, Tilarán, Province of Guanacaste, Costa Rica, altitude 750 meters, January 13, 1926, by Paul C. Standley and Juvenal Valerio (no. 44650).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: About Tilarán, *Standley & Valerio* 44637, 46205.

274. Piper injucundum Trel., sp. nov.

A shrub; twigs drying dark, softly appressed- or crisp-pubescent; leaves subelliptic, acuminate, slightly inequilaterally obtuse or subacute at base, 5.5 to 7×12 to 14 cm., pinnately nerved from the lower half, the nerves 4×2, dark-granular and finely lepidote above, appressed-pubescent on the nerves beneath, drying thin and bronzed beneath; petiole 3 to 5 mm. long, crisp-pubescent; spikes (young) 2×20 mm., on short glabrate peduncles; bracts round-subpeltate, the fuscous margin ciliclate.

Type in the U. S. National Herbarium, no. 1,307,649, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51351).

RANGE: Upper Reventazón Valley, Costa Rica.

274a. Piper injucundum praepubinervium Trel., var. nov.

Pubescence less crisp, the nerves granular-puberulent above.

Type in the U. S. National Herbarium, no. 1,307,627, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51067).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, *Standley & Torres* 51189. Pejivalle, Cartago, *Standley & Valerio* 46856, 46900, 46981, 47162.

274b. Piper injucundum praecalvinervium Trel., var. nov.

Pubescence less crisp than in the type, the twigs becoming pale-granular especially at the nodes; young spikes 2×40 mm. with sterile gray-hairy tip 2 mm. long.

Type in the U. S. National Herbarium, no. 1,307,628, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51101).

RANGE: Upper Reventazón Valley, Costa Rica.

275. Piper albuginiferum Trel., sp. nov.

A shrub; twigs retrorsely hispid; leaves lance-elliptic, acuminate, inequilaterally rounded at base, 4 to 5×10 to 11 cm., pinnately nerved from below the upper third, rugose, white-granular-scabrous, the nerves about 6+5, beneath upcurved-white-hispid; petiole 3+3 mm. long, upcurved-hispid, not winged; spikes (young) 2×30 mm., with sterile tip 2 mm. long; peduncle 5 mm. long,

glabrate, obscurely punctulate; bracts sublunulately subpeltate, ciliolate, the snowy margin forming a conspicuous prominence when young.

Type in the U. S. National Herbarium, no. 1,307,629, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51102).

RANGE: Upper Reventazón Valley, Costa Rica.

276. Piper phanerolepidum Trel., sp. nov.

A shrub; twigs hispid, pale-granular at the nodes; leaves narrowly lanceolate and subacute at base to ovate and rounded at base, gradually acuminate, 4 to 5×10 to 12 or 14 cm., pinnately nerved from the lower half, the nerves 5+4, salient beneath and appressed-hispid, the upper surface coarsely white-scabrous; petiole 5 to 7 mm. long, appressed-hairy or glabrescent and pale-granular; spikes 3×50 to 60 mm.; peduncle 10 mm. long, glabrous and pale-granular; bracts rounded-subpeltate, small but with conspicuous pale-ciliolate margin.

Type in the U. S. National Herbarium, no. 1,229,352, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33570).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, *Standley* 33448; *Standley & Valerio* 51039.

277. Piper lanatibracteum Trel., sp. nov.

Piper hirsutum carpinterae C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 160. 1897.

A shrub; twigs glabrous or quickly glabrescent, pale-granular; leaves lance-ovate or elliptic, sharply acuminate, inequilaterally obtuse at base, 4.5 to 5×10 to 12 cm., pinnately nerved from the lower half, coarsely white-granular-scabrous above, the nerves about 5+4, divaricately hirsute beneath; petiole about 5+2 mm. long, hirtellous or glabrescent and pale-granular, not winged; spikes 4×60 to 65 mm.; peduncle 3 to 6 mm. long, glabrate, pale-granular; bracts round-subpeltate, rather large, sublanately ciliate.

Type in the U. S. National Herbarium, no. 1,229,345, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33419).

RANGE: Upper Reventazón Valley and high divide, Costa Rica.

COSTA RICA: El Muñeco, *Standley & Torres* 51119. Cartago, *Torres* 56. Cerro de la Carpintera, *Pittier* "4339," 4349, type of *Piper hirsutum carpinterae; Standley* 35739. San Isidro Coronado, *Alfaro* 34002, 34012.

278. Piper lanosibracteum Trel., sp. nov.

A shrub; twigs from retrorsely hispid glabrescent and finely pale-granular; leaves lance-ovate or elliptic, acuminate, unequally rounded at base, 4.5 to 5.5×10 to 15 cm., pinnately nerved from the lower half, the nerves about 5+4, dark-punctulate and finely scabrous above, the nerves upcurved-hispid beneath; petiole 5+3 or 10 mm. long, upcurved-hirsute; spikes 3 to 4×60 to 80 mm.; peduncle 15 to 20 mm. long, hirtellous; bracts round-subpeltate, rather large, sublanately ciliate.

Type in the U. S. National Herbarium, no. 1,307,575, collected on the Río Reventado, Cartago, Costa Rica, altitude 1,500 meters, February 26, 1926, by Paul C. Standley and Juvenal Valerio (no. 49457).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Río Reventado, *Standley & Valerio* 49435, 49450, 49482.

279. Piper pullibracteatum Trel., sp. nov.

A shrub; twigs glabrous, obscurely glandular-punctulate, becoming pale-granular; leaves lanceolate-oblanceolate, long-acuminate, inequilaterally acute

at base, 4 to 5×13 to 15 cm., pinnately nerved from somewhat below the middle, the nerves about 6+5, granular-scabrous above, dark-punctulate beneath with the nerves spreading-hirsute; petiole 7+3 mm. long, glabrate, finely granular, not winged; spikes (young) 3×40 mm.; peduncle 5 mm. long, glabrous, slightly punctulate; bracts roundish-subpeltate, conspicuous, brown, ciliate.

Type in the U. S. National Herbarium, no. 1,229,471, collected at La Estrella, Province of Cartago, Costa Rica, March 26, 27, 1924, by Paul C. Standley (no. 39236).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 35496.

280. Piper fusco-bracteatum Trel., sp. nov.

A shrub; twigs from staring-hispid glabrescent and pale-granular; leaves lanceolate, attenuate, inequilaterally obtuse at base, 5.5 to 7×15 to 18 cm., pinnately nerved from the lower half, the nerves about 5×2, granular-scabrous above, spreading-hirsute on the nerves beneath and sparsely hirtellous between them; petiole 10, 10+2, or 15 mm. long, upcurved-subhirsute, pale-granular, not winged; spikes 3×60 mm.; peduncle 5 mm. long, glabrous, somewhat granular; bracts conspicuous, roundish-subpeltate, brown, ciliate.

Type in the U. S. National Herbarium, no. 1,229,678, collected on the Cerro de Piedra Blanca, Escasú, Province of San José, Costa Rica, January 31, 1924, by Paul C. Standley (no. 32631).

RANGE: High central divide of Costa Rica.

281. Piper curridabatanum Trel., sp. nov.

A shrub; twigs at most transiently pilose at the nodes, green- or pale-granular; leaves lanceolate, acuminate, inequilaterally acute at base, 4.5 to 6.5×12 to 16 cm., pinnately nerved from below the middle, the nerves about 5×2, minutely granular-roughened and at length lepidote above, the nerves hirsute beneath; petiole 12+3 to 18+3 mm. long, transiently hirsute, granular; spikes becoming 4×80 mm.; peduncle 5 to 7 or exceptionally 15 mm. long, glabrous, granular; bracts rounded-subpeltate, brown, ciliate; berries subquadrately obovoid, papillate, black; stigmas 3, sessile.

Type in the U. S. National Herbarium, no. 1,229,339, collected between San Pedro Montes de Oca and Curridabat, Province of San José, Costa Rica, altitude 1,200 meters, February 2, 1924, by Paul C. Standley (no. 32787).

RANGE: High central divide of Costa Rica.

282. Piper capacibracteum Trel., sp. nov.

A shrub; twigs retrorse-upcurved, hirsute-subvillous; leaves lanceolate, long-acuminate, inequilaterally obtuse at base, 4.5 to 6.5×14 to 16 cm., pinnately nerved from the lower half, the nerves about 6+5, appressed-pubescent above, becoming granular-scabrous softly hairy beneath, becoming more or less rugose; petiole about 10+5 mm. long, upcurved-hairy; spikes 4×75 mm., zonate; peduncle 15 to 20 mm. long, retrorsely hispid; bracts roundish-subpeltate, large, pale, ciliate.

Type in the U. S. National Herbarium, no. 1,307,249, collected between Aserrí and Tarbaca, Province of San José, Costa Rica, altitude 1,200 to 1,700 meters, December 6, 1925, by Paul C. Standley (no. 41397).

RANGE: High central divide of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley & Valerio* 43121, 43245, 43246, 41812, 41839, 41861, 42457, 42836, with shorter peduncle and subacute leaf-base. Peralta, *Stevens* 477.

283. Piper ventoleranum Trel., sp. nov.

A shrub; twigs glabrous or quickly glabrescent, pale-granular; leaves lanceolate, caudate, inequilaterally subacute at base, 4.5 to 7×15 to 17 cm., pinnately nerved from the lower half, the nerves about 6+5, minutely granular-roughened above, the nerves beneath typically subappressed-hirsute; petiole 10+2 or 15 mm. long, mostly glabrate, not winged; spikes 3 to 4×80 to 95 mm.; peduncle 10 mm. long, somewhat granular; bracts rounded-subpeltate, cinereous, ciliate.

Type in the U. S. National Herbarium, no. 1,229,373, collected at La Ventolera, southern slope of Volcán de Poás, Costa Rica, altitude 1,700 meters, February 17, 18, 1924, by Paul C. Standley (no. 34712).

RANGE: Central volcanoes of Costa Rica.

COSTA RICA: In the type locality, *Standley* 34707; 34724, with larger leaves, becoming 7.5×20 cm.; 34663, with hairy petiole.

284. Piper perhispidum C. DC. Bot. Gaz. 70: 183. 1920.

TYPE LOCALITY: Río Barranca, San Juan de San Ramón, Costa Rica (*Tonduz* 17771, the type).

RANGE: Pacific slope of Costa Rica.

285. Piper domingense C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 161. 1897.

TYPE LOCALITY: Santo Domingo de Golfo Dulce, Costa Rica (*Tonduz* 10034, the type; distributed also as J. D. Smith 7129).

RANGE: Pacific coast region of Costa Rica.

286. Piper flavescens (C. DC.) Trel.

Piper pseudovelutinum flavescens C. DC. Bull. Soc. Bot. Belg. 30[1]: 203. 1891.

TYPE LOCALITY: Río Tilirí, near San José, Costa Rica (*Tonduz* 3175, the type).

RANGE: High central divide of Costa Rica.

287. Piper suberythrocarpum C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 160. 1897.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Tonduz* 7550, the type).

RANGE: Caribbean lowlands of Costa Rica and adjacent Nicaragua.

288. Piper pileatum Trel., sp. nov.

Piper burenii Auct., as to Costa Rica.

A shrub; twigs densely dingy-hispid; leaves lanceolate, subfalcately acuminate, inequilaterally acute at base or one side rounded or subcordulate, 4 to 6×12 to 16 cm., pinnately nerved from below the middle, the nerves 4 or 5×2, bullulate, scabrous, sparsely white-villous, especially beneath; petiole 8 to 12+3 mm., dingy-villous, not winged; spikes 3×100 mm.; peduncle 10 to 15 mm. long, hispid; bracts roundish-subpeltate, gray-ciliate.

Type in the herbarium of the New York Botanical Garden, collected at El Copey, Costa Rica, altitude 1,800 meters, February, 1898, by A. Tonduz (no. 11895). Duplicate in the U. S. National Herbarium.

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El Copey, *Jiménez* 1089; *Tonduz* 11895. Buenos Aires, *Tonduz* 3593, "3693." El General, *Tonduz* 3383. Cañas Gordas, ? *Pittier* 11033. Tremendal, San Ramón, *Tonduz* 17773. San Marcos, *Tonduz* 7555.

288a. Piper pileatum obliquum Trel., var. nov.

Differs in its broadly lanceolate leaves being very oblique, with the distinctly longer side rounded at base.

Type in the U. S. National Herbarium, no. 796,376, collected at El Copey, Costa Rica, altitude 1,800 meters, February, 1898, by A. Tonduz (no. 11675).

RANGE: Pacific slope of Costa Rica.

289. Piper rugosifolium Trel., sp. nov.

Piper hirsutum pallescens Auct., p. p.

A shrub; twigs retrorsely rusty-hirsute with upcurved hairs; leaves obliquely lanceolate, subcaudately acuminate, rounded at base or with one side acute, 4 to 4.5×9 to 11 cm., pinnately nerved from below the middle, the nerves about 6+5, rugose, coarsely granular-scabrous above from the bases of slender hairs, beneath dingy-hairy, at least as to the nerves; petiole 5 to 10 mm. long, retrorsely long-hirsute, not winged; spikes 3×70 mm., mucronate; peduncle 5 mm. long, curved-hirsute; bracts roundish-subpeltate, ciliolate.

Type in the U. S. National Herbarium, no. 1,307,251, collected at Finca Las Cóncavas, Province of Cartago, Costa Rica, altitude 1,300 meters, December 7, 8, 1925, by Paul C. Standley (no. 41533).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cerro de la Carpintera, *Standley* 34262. Río Reventado, *Standley & Valerio* 49441. Cervantes, *Tonduz* 10431. Los Frailes, *Tonduz* 17876. San Marcos, *Tonduz* ? 7555, 17761. Dulce Nombre, *Standley* 35928. El Muñeco, Río Navarro, *Standley & Torres* 50920. Cartago, *Standley* 35467. Río Reventazón, *Rowlee & Stark* 754.

290. Piper pseudopsis C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 164. 1897.

Piper bredemeyeri Auct., as to Costa Rica.

TYPE LOCALITY: San José, Costa Rica (*Tonduz* 1088, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: San José, *Brade* 2037; *Standley* 33274, 41215, 47365; *Tonduz* 2847. Río María Aguilar, *Tonduz* 6957 (J. D. Smith 7298). San Francisco de Guadalupe, *Tonduz* 444, 1795, 8026, 12730. San Sebastián, *Standley* 32684, 49350. Río Reventado, Cartago, *Standley & Valerio* 49498. Finca Las Cóncavas, Cartago, *Standley* 41494.

4. PEPEROMIA Ruiz & Pavon

KEY TO SPECIES

1. Leaves alternate (the uppermost sometimes congested because of shortened internodes, or the lowest rarely opposite)——2.
   Leaves opposite or whorled——95.
2. Leaves or some of them distinctly peltate——3.
   Leaves not peltate above the very base——9.
3. Leaves basal; spikes filiform, subpaniculate——7. **P. sciaphila.**
   Leaves cauline; spikes mostly stouter——4.
4. Stem comparatively short and stout, few-leaved——5.
   Stem elongate and leafy——6.
5. Pilose——10. **P. tecticola.**
   Glabrous——9. **P. chambesyana.**
6. Leaves drying thin; pubescent——8. **P. amphitricha.**
   Leaves drying coriaceous——7.
7. Leaves 10 to 15 cm. long——8.
   Leaves mostly 4 to 6 cm. long; glabrous——90. **P. peltilimba.**
8. Leaves ciliate; spikes axillary——89. **P. ciliifera.**
   Glabrous; spikes terminal——88. **P. parmata.**
9. Spikes in leafless panicles; veining pinnate——10.
   Spikes not paniculate——28.
10. Panicle compound; spikes very short——68. **P. poasana.**
    Panicle simple or spikes elongate——11.

11. Spikes 2 to 3 cm. long; drying dark ..... 12.
Spikes longer; stem leafy ..... 17.
12. Stem short, few-leaved ..... 13.
Stem elongate and leafy; hairy ..... 76. P. guapilesiana.
13. Scape very short; leaves subelliptic ..... 71. P. breviscapa.
Scape elongate ..... 14.
14. Leaves subspatulate-oblanceolate; glabrous ..... 72. P. subacaulis.
Leaves elliptic-oblanceolate or obovate ..... 15.
15. Leaves over 20 cm. long; glabrous ..... 70. P. atirroana.
Leaves 10 to 15 cm. long ..... 16.
16. At most puberulent ..... 69. P. brevicaulis.
At least locally hairy ..... 93. P. compotrix.
17. At least transiently hairy ..... 18.
Glabrous ..... 20.
18. Leaves obtuse at base, elliptic ..... 78. P. pothifolia.
Leaves acute at base ..... 19.
19. Leaves elliptic ..... 79. P. substriata.
Leaves oblanceolate-obovate ..... 92. P. tsakiana.
20. Leaves subsessile ..... 21.
Leaves obviously petioled ..... 22.
21. Leaves rather blunt, subspatulate ..... 73. P. sessilifolioides.
Leaves pointed, narrowly oblanceolate ..... 74. P. venabulifolia.
22. Leaves rather blunt, subelliptic ..... 101. P. navarrana.
Leaves acuminate ..... 23.
23. Leaves elliptic ..... 24.
Leaves lanceolate to elliptic oblanceolate ..... 26.
24. Spikes about 40 mm. long ..... 25.
Spikes longer ..... 99. P. dotana.
25. Leaves 10 to 15 cm. long ..... 100. P. isidroana.
Leaves 6 to 10 cm. long ..... 103. P. tremendalensis.
26. Spikes drying dark 27
Spikes drying pale ..... 75. P. lancilimba.
27. Scutulum of ovary elongate ..... 91. P. acutilimba.
Scutulum rounded; berries oblong ..... 110. P. calvifolia.
28. Leaves pinnately nerved or else spikes paired 29
Leaves essentially palmately nerved ..... 49.
29. Leaves appreciably cordate or obtuse at base 30
Leaves appreciably acute at base unless very small 36
30. Leaves cordate or else spikes not paired 31
Spikes paired if leaves cordate ..... 34.
31. Leaves over 10 cm. long ..... 94. P. platyphylla.
Leaves 5 to 10 cm. long ..... 32.
Leaves 4 to 6 cm. long ..... 33.
32. Stem elongate and leafy ..... 20. P. vinasiana.
Stem thick, naked below ..... 11. P. lignescens.
33. Leaves round-ovate ..... 12. P. aguacatensis.
Leaves elliptic-ovate ..... 14. P. tenuifolia.
Leaves ovate, subunguiculate ..... 15. P. nicoyana.
34. Leaves fully twice as long as broad ..... 35.
Leaves shorter; berries stipitate ..... 6. P. podocarpa.
35. Glabrous ..... 95. P. scutellata.
Crisp-puberulent ..... 96. P. donnell-smithii.
Somewhat hairy ..... 97. P. calvicaulis.

36. Leaves over 20 cm. long——77. P. queserana.
Leaves commonly 10 to 15 cm. long——37.
Leaves commonly 6 to 10 cm. long——39.
Leaves commonly 4 to 6 cm. long——43.
37. Leaves spatulate or elliptic-obovate, blunt——106. P. mentiens.
Leaves subelliptic, pointed——38.
38. Erect, drying green——98. P. cacuminicola.
Repent-pendent, darkening——84. P. glaberrima.
39. Glabrous——40.
Petioles and nodes somewhat hairy——81. P. longibacca.
Nerves villous beneath——82. P. orientalis.
40. Repent-pendent, drying dark——41.
Stoloniferous-erect——42.
41. Leaves lanceolate, pointed, petioled——83. P. naranjoana.
Leaves elliptic, bluntish, subsessile——80. P. glabricaulis.
42. Leaves elliptic, subacute——102. P. durandi.
Leaves round-obovate, very blunt——107. P. pyrolaefolia.
43. Repent-pendent, or drying dark——44.
Stoloniferous-erect, drying yellow-green——47.
44. Leaves subsessile, glabrous——84. P. glaberrima.
Leaves short-petioled——45.
45. Leaves sublanceolate——46.
Leaves broadly elliptic——86. P. tilarana.
46. Essentially glabrous——87. P. borucana.
Somewhat hairy at nodes——85. P. circumscissa.
47. Leaves very obtuse——108. P. pseudo-alpina.
Leaves blunt-acuminate——48.
Leaves acute at both ends——19. P. bistortaefolia.
48. Spikes 60 to 80 mm. long——104. P. pachyphlebia.
Spikes longer and slenderer——105. P. peninsularis.
49. Leaves appreciably obtuse at base——30.
Leaves appreciably acute at base, unless very small or with a single spike——50.
50. Leaves distinctly longer than broad——51.
Leaves approximately isodiametric——78.
51. Bracts ciliate——52.
Bracts not ciliate——53.
52. Leaves scarcely 2 by 4 cm.——21. P. costaricensis.
Leaves becoming 4 by 7 cm.——22. P. fimbribractea.
53. Not black-punctulate, even if granular——54.
Conspicuously black-punctulate——77.
54. Leaves drying rather thin——55.
Leaves, unless very small, opaquely coriaceous——67.
55. Leaves subovate——56.
Leaves elliptic or elliptic-obovate——39. P. erythrophlebia.
Leaves lance-elliptic——57.
Leaves rhombic-elliptic——18. P. cooperi.
Leaves lanceolate or oblanceolate——62.
56. Leaves cordate, appressed-pubescent——33.
Leaves round-based, hairy——35. P. montecristana.
Leaves acute-based, puberulent——52. P. tenuicaulis.
57. Glabrous——58.
Puberulent or pubescent——60.

58. Leaves 6 to 10 cm. long ..... 25. P. crispipetiola.
Leaves 3 to 6 cm. long ..... 59.
59. Nerves scarcely raised ..... 27. P. herediana.
Inner nerves salient ..... 28. P. munyecoana.
60. Leaves 6 to 10 cm. long ..... 26. P. carpinterana.
Leaves 5 to 6 cm. long ..... 61.
61. Spikes filiform ..... 16. P. subdita.
Spikes stouter; bracts dark-punctulate ..... 48. P. tuisana.
62. Spikes without pseudo-pedicels ..... 63.
Spikes with long pseudo-pedicels ..... 31. P. pseudopedicellata.
63. Leaves granular beneath ..... 64.
Leaves scarcely granular ..... 65.
64. Leaves lance-elliptic or obovate ..... 30. P. vueltasana.
Leaves lance-oblong ..... 33. P. pilulifera.
65. Leaves finely pale-mottled beneath ..... 34. P. niveo-punctulata.
Leaves not pale-punctulate ..... 66.
66. Petioles subalately decurrent ..... 32. P. dyscrita.
Petioles not decurrent ..... 42. P. stenophylla.
67. Leaves 4 to 6 cm. long ..... 68.
Leaves 1 to 2.5 cm. long ..... 71.
Leaves scarcely over 1 cm. long ..... 75.
68. Leaves rhombic-elliptic ..... 37. P. chrysocarpa.
Leaves lance-elliptic ..... 69.
69. Spikes without pseudo-pedicels ..... 70.
Spikes with short pseudo-pedicels ..... 41. P. brachypus.
70. Leaves green on both sides ..... 36. P. san-joseana.
Leaves red-purple beneath ..... 40. P. versicolor.
71. Essentially glabrous ..... 72.
Leaves obscurely hairy or ciliate ..... 43. P. stenophyllopsis.
Young growth pubescent ..... 44. P. fissispica.
72. Leaves lanceolate or elliptic ..... 38. P. psiloclada.
Leaves oblong ..... 73.
Leaves subrhombic ..... 74.
73. Berries sessile ..... 50. P. hylophila.
Berries stipitate ..... 5. P. tenuipes.
74. Leaf-base subcuneate ..... 47. P. fraijanesana.
Leaf-base merely acute ..... 46. P. zurquiana.
75. Leaves oblong-subovate ..... 51. P. tenellaeformis.
Leaves oblong-obovate; glabrous ..... 57. P. incisa.
Leaves elliptic-obovate; hairy ..... 54. P. tonduzii.
Leaves elliptic; plant stoloniferous-erect ..... 76.
76. Stem loosely hairy ..... 53. P. punctataefolia.
Stem pubescent ..... 55. P. oerstedii.
77. At most ciliate-lined ..... 23. P. jimenesana.
More or less hairy ..... 24. P. filicaulis.
78. Leaves drying rather thin ..... 79.
Leaves drying coriaceous ..... 88.
79. Leaves 4 to 6 cm. long ..... 29. P. virillana.
Leaves usually 2.5 to 4 cm. long ..... 80.
Leaves usually 1 to 2.5 cm. long ..... 81.
Leaves scarcely 1 cm. long ..... 85.
80. Leaves cordate, acute ..... 12. P. aguacatensis var.
Leaves reniform, very obtuse ..... 13. P. lagartana.

81. Glabrous——82.
Puberulent; anthers small——17. P. filispica.
Puberulent; anthers large——61. P. cryptolepida.
Sparsely soft-hairy——2. P. barbensis var.
82. Leaves subacute; pellucid——1. P. pellucida.
Leaves very obtuse——83.
83. Drying brown; anthers large——62. P. megalanthera.
Drying green——84.
84. Leaf-base obtuse; anthers large——60. P. delecta.
Leaf-base usually acute——59. P. rejecta.
85. Leaves round or round-obovate——86.
Leaves round- or reniform-ovate——87.
86. Glabrous or few-haired——4. P. delicatissima.
Velvety or crisp-pubescent——58. P. rotundifolia.
87. Leaves round-ovate——56. P. silvivaga.
Leaves subelliptic-ovate——2. P. barbensis.
Leaves reniform-ovate——3. P. late-ovata.
88. Leaves 1 to 2.5 or even 4 cm. long——89.
Leaves scarcely over 1 cm. long——95.
89. Creeping——90.
With erect stems——92.
90. Anthers relatively large——81.
Anthers minute——91.
91. Glabrous——63. P. reptabunda.
Somewhat puberulent——67. P. calyculata.
Crisp-pubescent——109. P. pseudo-casaretti.
92. Stems subsimple——93.
Stems much branched——45. P. multifida.
93. Leaves round-ovate, subacute——49. P. chlorostachya.
Leaves suborbicular, obtuse——64. P. san-ramonensis.
Leaves subobovate——94.
94. Spikes without pseudo-pedicels——65. P. congestifolia.
With pseudo-pedicels——66. P. candelaber.
95. Leaves opposite, very obtuse——96.
Leaves whorled, or acute if exceptionally opposite——98.
96. Creeping——97.
Erect; leaves round, 1 to 1.5 cm. in diameter——123. P. esperanzana.
97. Leaves round, scarcely 1 cm. in diameter——131. P. cyclophylla.
Leaves round-elliptic, larger——130. P. pirrisana.
98. Leaves obovate——99.
Leaves subquadrately elliptic, or small if not quadrate——104.
Leaves lanceolate or oblanceolate to elliptic——107.
Leaves, at least above, oblong or linear——118.
99. Rachis of spike hirtellous——100.
Rachis of spike glabrous——101.
100. Leaves emarginulate——129. P. subemarginulata.
Leaves scarcely emarginulate——136. P. pseudo-hoffmannii.
101. Leaves round-obovate——102.
Leaves elliptic-obovate——103.
102. Creeping and delicate——135. P. hoffmannii.
With erect branches——132. P. imbricata.
103. Erect; very glandular-granular——134. P. sepicola.
Creeping; not glandular——133. P. pseudo-tetraphylla.

104. Leaves 1.5 to 2.5 cm. long; rachis glabrous ..... 105.
Leaves 1 to 1.5 cm. long; rachis hirtellous ..... 126. P. cartagoana.
Leaves scarcely 1 cm. long ..... 106.
105. Peduncle 30 mm. long ..... 118.
Peduncle scant 25 mm. long ..... 121. P. emiliana.
106. Bracts golden-granular ..... 127. P. reflexaefolia.
Bracts not golden-granular ..... 128. P. compaginata.
107. Leaves 6 to 10 cm. long ..... 108.
Leaves 2.5 to 6 cm. long ..... 110.
Leaves 1 to 2.5 cm. long ..... 114.
108. Leaves relatively thin ..... 109.
Leaves coriaceous ..... 116. P. guanacastana.
109. Leaves broadly elliptic ..... 115. P. nemoralis.
Leaves relatively narrow ..... 112. P. martagonifolia.
110. At most puberulent ..... 111.
More or less pubescent ..... 112.
111. Leaves whorled, acuminate ..... 113. P. turialvensis.
Leaves whorled, acute ..... 111. P. jarisiana.
Leaves opposite or whorled ..... 119. P. palmana.
112. Leaves glabrous ..... 113.
Leaves somewhat hairy ..... 118. P. stipitifolia.
113. Internodes somewhat hairy ..... 114. P. barbana.
Internodes glabrous ..... 117. P. barbinodis.
114. Glabrous ..... 115.
Subpuberulent ..... 116.
More or less hairy ..... 117.
115. Leaves attenuate at both ends ..... 124. P. aguacalientis.
Leaves more elliptic ..... 125. P. pseudo-boliviensis.
116. Peduncle scarcely 1 cm. long ..... 119. P. palmana var.
Peduncle distinctly longer ..... 121. P. emiliana.
117. Leaves oblanceolate ..... 122. P. olivacea.
Leaves lance-elliptic ..... 120. P. copeyana.
118. At most minutely puberulent ..... 119.
At least locally pubescent ..... 138. P. oblongifolia.
119. Upper leaves elliptic-oblong ..... 139. P. muscisedens.
Upper leaves oblong ..... 137. P. amphoterophylla.
Upper leaves linear ..... 140. P. pittieri.

1. Peperomia pellucida (L.) H. B. K. Nov. Gen. & Sp. 1: 64. 1815.

Piper pellucidum L. Sp. Pl. 30. 1753.

TYPE LOCALITY: Martinique?

RANGE: Throughout the West Indies, and on the continent from Mexico to the Andes, commonly in the more whitened-leaved *P. pellucida pygmaea Miq.*[8] (*P. pygmaea* Kunth[9]), the type of which is from Loja, Ecuador. Also introduced as a weed into Africa.

COSTA RICA: La Colombiana Farm, *Standley* 36676. Below Cairo, *Standley & Valerio* 48872, 48995, 49020. Boca de Zhorquín, *Tonduz* 8620. Hacienda de Zent, *Tonduz* 1465. Mano de Tigre Road, *Tonduz* 4658. Boruca, *Pittier* 4659. Lagarto, *Pittier* 4486. Rancho Redondo, Volcán de Irazú, *Pittier* 1141.

[8] Syst. 81. 1843. [9] Syn. 1: 117. 1923.

2. Peperomia barbensis (Dahlst.) Trel.

Peperomia hispidula barbensis Dahlst. Svensk. Vet. Akad. Handl. 33²: 14. 1900.

Peperomia hispidula Auct., as to Costa Rica.

TYPE LOCALITY: Volcán de Barbá, Costa Rica (*Hoffmann* 54, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Finca La Cima, El Copey, *Standley* 42634. Tablazo, *Brade* 2016.

2a. Peperomia barbensis alajuelana Trel., var. nov.

A medium-sized, erect or assurgent, branching herb; stem slender (1 to 2 mm.), soft-villous; leaves alternate, round-elliptic or subrhombic-ovate, obtuse or subacute at both ends, small (1×1 to 1.5×2 to 2.5 cm., or exceptionally lance-elliptic and 4 cm. long), rather sparsely villous with articulate hairs, multiple-nerved, the branches of the midrib about 3×2; petiole 5 to 20 mm. long, loosely villous; spikes terminal and opposite the leaves, extremely slender, 10 to 15 mm. long, loosely flowered; peduncle equaling the spike, sparsely villous; bracts round-peltate; berries ellipsoid, with slender stipe and style; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,258, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47695).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cerro de las Vueltas, altitude 2,700 to 3,000 meters, *Standley & Valerio* 43769.

3. Peperomia late-ovata Trel., sp. nov.

A small delicate repent-assurgent arboricolous herb; stem filiform, sparsely villous to glabrescent; leaves alternate, reniform-ovate, obtuse, rounded at base or slightly cordulate, minute (3 to 8×4 to 8 mm.), sparsely villous with articulate hairs, 3 or 5 nerved, with the midrib obscurely branched; petiole very short (1 mm.), glabrate; spikes terminal, extremely slender, scarcely 15 mm. long, loosely flowered; peduncle about 10 mm. long; bracts round-peltate; berries subclavate-oblong, with slender stipe and style; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,136, collected at Laguna de la Chonta, near Santa María de Dota, Province of San José, Costa Rica, altitude 2,000 to 2,100 meters, December 18, 1925, by Paul C. Standley (no. 42310).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley* 42183, 42194, 42201, 42246. San José, *Standley* 38629, 38780.

3a. Peperomia late-ovata glabrata Trel., var. nov.

Differs in being almost glabrous.

Type in the U. S. National Herbarium, no. 1,229,662, collected at Las Nubes, Province of San José, Costa Rica, altitude 1,500 to 1,900 meters, March 20–22, 1924, by Paul C. Standley (no. 38489).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Laguna de la Escuadra, near El Copey, *Standley* 42083. Finca La Cima, near El Copey, *Standley* 42652.

4. Peperomia delicatissima Trel., sp. nov.

Peperomia emarginella glabrior C. DC. Anal. Fis.-Geogr. Costa Rica 9: 177. 1897.

An extremely delicate arboricolous herb, creeping among mosses; stem filiform, glabrous; leaves alternate, orbicular, sometimes emarginulate, obscurely 3 nerved, minute (3 mm.), with a few long white hairs toward the apex; petiole 2 to 3 mm. long, glabrous; spikes terminal, 2 cm. long; peduncle glabrous, 8 mm. long; bracts round-peltate; ovary ovoid; stigma oblique.

Type in the DeCandolle Herbarium, collected at Río Naranjo, Costa Rica, altitude 200 to 250 meters, by A. Tonduz (no. 8002).

RANGE: Caribbean lowlands of northern Costa Rica.

COSTA RICA: Pejivalle, *Standley & Valerio* 46979, 47249. Guápiles, *Standley* 37546. Río Rosario, Llanos de Santa Clara, *Pittier* 13424 (distributed as *Lemna minor* by J. D. Smith, no. 7605).

5. Peperomia tenuipes Trel., sp. nov.

A small stoloniferous glabrous herb; stem slender (1 mm.); leaves alternate, elliptic-oblong or the lower elliptic, emarginate, acute-based, small (5×12 to 8×16, or the lower 10×14 mm.), 1 nerved, coriaceous; petiole 3 mm. long; spikes terminal, 1×35 mm., rather loosely flowered, the flowers between anastomosing ridges; peduncle 5 mm. long; bracts round-peltate; berries obovoid, on equilong filiform pedicels, with a conspicuous oblique stylopodium; stigma apical.

Type in the U. S. National Herbarium, no. 577,942, collected on Cerro de las Caricias, above San Isidro, Province of Heredia, Costa Rica, September, 1900, by H. Pittier (no. 14042).

RANGE: Central mountains of Costa Rica.

6. Peperomia podocarpa C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

TYPE LOCALITY: El General, Costa Rica (*Pittier* 10595, the type).

RANGE: Central mountains of Costa Rica.

7. Peperomia sciaphila C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

Peperomia schizostachya Trel. Bot. Gaz. 73: 138. 1922.

Peperomia ovato-peltata Auct., as to Costa Rica.

TYPE LOCALITY: Río Virilla, San José, Costa Rica (*Tonduz* 9630, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Río Virilla, *Tonduz* 10106 (J. D. Smith 7273); *Hoffmann* 521. Mount Candelaria, *Endres*.

8. Peperomia amphitricha Trel., sp. nov.

Peperomia lanceolato-peltata Auct., p. p., as to Costa Rica.

A repent arboricolous herb; stem slender (2 mm.), at least transiently sparsely white-villous, rooting from many nodes; leaves alternate, peltate about 1 cm. above the rounded base, round-ovate, acuminate, moderate (3.5 to 4 or 5×5 to 7 cm.), drying thin but opaque, obscurely about 7 nerved, paler beneath, with sparse soft white hairs on both faces; petiole 2 to 4 cm. long, sparsely villous; spikes terminal, long (2×100 mm. or more); peduncle elongate (3 to 4 cm.), sparsely villous; bracts round-peltate; berries subglobose; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,160, collected at Quebradillas, near Santa María de Dota, Province of San José, Costa Rica, altitude 1,800 meters, December 24, 1925, by Paul C. Standley (no. 43089a).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Cerro de Piedra Blanca, near Escasú, *Standley* 32632.

8a. Peperomia amphitricha santa-rosana Trel., var. nov.

Peperomia lanceolato-peltata Auct., p. p., as to Costa Rica.

An assurgent terrestrial herb; stem rather slender (2 to 3 mm.), transiently sparsely hairy, rooting from the lower nodes; leaves alternate, peltate toward the rounded base, round-ovate, somewhat obliquely acuminate, moderately small (2×3.5, 3×4.5, or 4×6 cm.), 5 or 7 nerved, paler and sparsely crisp-hairy beneath; petiole moderately long (2 to 4 cm.), very sparsely villous, clasping-decurrent; spikes terminal or opposite the leaves, elongate (2×80 to 120 mm.), rather loosely flowered; peduncle elongate (3 to 4 cm.), villous,

especially upward; rachis villous; bracts round-peltate; berries glabrous; stigma suboblique.

Type in the De Candolle Herbarium, Geneva, collected at Santa Rosa de Copey, Province of San José, Costa Rica, by A. Tonduz (no. 12225).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Río Blanco, near El Copey, *Standley* 41889. Finca La Cima, near El Copey, *Standley* 42620.

9. Peperomia chambesyana Trel., sp. nov.

Peperomia arifolia acutifolia C. DC.; Trel. Bot. Gaz. 73: 142. 1922.

A moderately small, glabrous herb; stem short and comparatively stout (4 mm.); leaves alternate, few at top of the stem, ovate, acute, round-based, peltate, 3.5×5 to 6 cm., about 7 nerved; petiole slender, 6 to 8 cm. long; spikes few, from the upper axils, 2×70 mm.; peduncle 7 cm. long; bracts round-ovate, peltate.

Cultivated at Chambésy, Switzerland, in 1898, from seed ascribed to Costa Rica; otherwise unknown. The type is a specimen in the DeCandolle Herbarium at Geneva.

10. Peperomia tecticola C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

TYPE LOCALITY: San José, Costa Rica (*Tonduz* 7262, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: San José, *Tonduz* 7309.

10a. Peperomia tecticola muricola Trel. Bot. Gaz. 73: 143. *pl. 3.* 1922.

Peperomia lanceolato-peltata Auct., p. p., as to Costa Rica.

TYPE LOCALITY: San Juan, Costa Rica (*Tonduz* 10146, the type).

RANGE: High central divide of Costa Rica.

COSTA RICA: Río Virilla, *Hoffmann* 204, 414.

10b. Peperomia tecticola tilirina Trel., var. nov.

Peperomia puberula Auct., as to Costa Rica.

A form with even longer and more filiform petioles and more ovate-oblong leaves.

Type in the U. S. National Herbarium, no. 796,722, collected along Río Tiliri, Province of San José, Costa Rica, December, 1890, by A. Tonduz (no. 3208).

RANGE: High central divide of Costa Rica.

11. Peperomia lignescens C. DC. Journ. Bot. Brit. & For. 4: 137. 1866.

TYPE LOCALITY: Unspecified (*Hoffmann*).

RANGE: Mountains of southern Costa Rica.

COSTA RICA: Térraba, *Pittier* 3605 in part. El General, *Pittier* 3399.

11a. Peperomia lignescens carthaginensis (C. DC.) Trel.

Peperomia carthaginensis C. DC. Linnaea 37: 377. 1872.

TYPE LOCALITY: Cartago, Costa Rica (*Oersted* 925, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Río Virilla, *Tonduz* 1378. Torres, *Tonduz* 8425. San José, *Pittier* 3006. Desamparados, *Tonduz* 1690. Curridabat, *Pittier* 3045. Boruca, *Pittier* 4783. Aserrí to Tarbaca, *Standley* 41351, 41395. San Marcos, *Jiménez*, in 1926. Pozo Azul de Pirrís, *Lankester* 1172.

11b. Peperomia lignescens subcuneilimba Trel., var. nov.

Erect, thick-stemmed, with very short internodes, glabrous; leaves caducous except at the summit, lanceolate, acute or exceptionally obtuse-based, 2×4 to nearly 3×6 cm., black-punctulate; spikes terminal (or from an upper axil), 2×110 mm.; petiole long (3 to 7 cm.) and slender; peduncle 25 mm. long; berries globose, with pseudocupule, mucronate; stigma terminating the beak.

Type in the U. S. National Herbarium, no. 1,251,105, collected at Santa María de Dota, Province of San José, Costa Rica, altitude 1,500 to 1,800 meters, December, 1925, by Paul C. Standley (no. 41564).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Type locality, *Standley* 42115.

12. Peperomia aguacatensis C. DC. Linnaea 37: 376. 1872.

TYPE LOCALITY: Mount Aguacate, Costa Rica (*Oerstcd* 217, the type).

RANGE: Pacific slope of Costa Rica.

12a. Peperomia aguacatensis orosiana Trel., var. nov.

A rather small, repent, arboricolous herb; stem slender (2 mm.), rooting from many nodes, transiently slightly crisp- or appressed-pubescent; leaves alternate, round-ovate, acuminate, rounded at base or cordulate, rather small (2×3 to 4×5 cm.), 5 or obscurely 7 nerved, for a time appressed-pubescent above; petiole short (1 to 2 cm.), slightly soft-pubescent; spikes few, terminal and axillary, rather small (2×30 to 40 mm.), closely flowered; peduncle 1.5 to 2 cm. long, bracted near the middle, glabrate; bracts round-peltate; berries oblong, obtuse; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,229,331, collected at Orosi, Province of Cartago, Costa Rica, March 30, 1924, by Paul C. Standley (no. 39779).

RANGE: Central mountains of Costa Rica.

12b. Peperomia aguacatensis picta Trel., var. nov.

Stem and leaves blotched with dark red.

Type in the U. S. National Herbarium, no. 1,251,340, collected at El Muñeco, south of Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Juvenal Valerio (no. 51660).

RANGE: Central mountains of Costa Rica.

12c. Peperomia aguacatensis urocarpoides Trel., var. nov.

A delicate creeping herb with the stem, petiole, and peduncle minutely crisp-pubescent; leaves ovate, subacuminate, round-based, 2.5 to 3×3 to 4 cm., 5 nerved.

Type in the DeCandolle Herbarium, collected at Victoria, Planas de Zent, Costa Rica, by H. Pittier (no. 16084).

RANGE: Caribbean lowlands of Costa Rica.

13. Peperomia lagartana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 177. 1897.

TYPE LOCALITY: Boruca to Lagarto, Province of Puntarenas, Costa Rica (*Tonduz* 4660, the type).

RANGE: Upper Pacific slope of Costa Rica.

The name sometimes is spelled *lagartoana*.

14. Peperomia tenuifolia C. DC. Linnaea 37: 371. 1872.

TYPE LOCALITY: Mount Aguacate, Province of Alajuela, Costa Rica (*Oersted* 1001, the type).

RANGE: Pacific slope of Costa Rica.

15. Peperomia nicoyana C. DC. Candollea 1: 341. 1923; 2: 188. 1925.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13692, the type).

RANGE: Lowlands of northwestern Costa Rica.

16. Peperomia subdita Trel., sp. nov.

A rather small hirsute herb; stem slender (2 mm.), nodose; leaves alternate above, opposite below, subrhombic-lanceolate, bluntly and slightly acuminate at both ends, moderate (scarcely 2.5×6 cm.), drying rather thin, about 5 nerved; petiole short (5 mm.); spikes terminal, paired on a filiform stalk 2

cm. long, filiform and moderately elongate (scarcely 1×50 mm.), loosely flowered; peduncle filiform, 1 cm. long; bracts round-peltate; ovary conic-ovoid; st gma apical.

Type in the U. S. National Herbarium, no. 796,574, collected at La Estrella, Province of Cartago, Costa Rica, altitude 1,300 meters, April, 1888, by J. J. Cooper (no. 192); distributed by John Donnell Smith as no. 5927.

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Santiago, *Maxon* 109. Finca Las Cóncavas, *Standley* 41516.

17. Peperomia filispica C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 177. 1897.

TYPE LOCALITY: Alto de Ochomogo, Costa Rica (*Pittier* 10386, the type).

RANGE: Central mountains of Costa Rica.

Scarcely more than a form of *P. cooperi*, with smaller and rounder leaves.

18. Peperomia cooperi C. DC. Bull. Soc. Bot. Belg. 30[1]: 226. 1891.

Peperomia dendrophila Auct., as to Costa Rica.

Peperomia petiolaris Auct., as to Costa Rica.

TYPE LOCALITY: La Estrella, Province of Cartago, Costa Rica (*Cooper* 141, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Estrella, *Cooper* 142, 192 in part. Finca Las Cóncavas, *Lankester* 259; *Standley* 41513. Río Tilirí, *Pittier* 3207. San Juan, Río Virilla, *Tonduz* 945 bis. La Verbena, Alajuelita, *Tonduz* 8866. San José, *Hoffmann* 823. San Francisco de Guadalupe, *Pittier* 7161.

19. Peperomia bistortaefolia Trel., sp. nov.

A rather small erect glabrous herb; stem rather slender (1 to 3 mm.); leaves alternate, narrowly lanceolate or lance-oblong, gradually subobtuse, cuneate, moderately small (about 1×6 cm.), pinnately nerved, drying subcoriaceous, more or less revolute, dull, yellow and granular beneath; petiole scarcely 5 mm. long and winged to the base or qu te suppressed; spikes terminal, scarcely 2×40 mm., rather loosely flowered; peduncle filiform, 15 to 20 mm. long; bracts round-peltate, comparatively large; ovary round-ovoid, apiculate; stigma essentially apical.

Type in the U. S. National Herbarium, no. 1,251,183, collected at Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December 30, 1925, by Paul C. Standley and Juvenal Valerio (no. 44008).

RANGE: High central divide of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 43693.

20. Peperomia vinasiana C. DC. Bull. Soc. Bot. Belg. 30[1]: 231. 1891.

TYPE LOCALITY: Juan Viñas, Province of Cartago, Costa Rica (*Pittier* 2199, the type).

RANGE: Reventazón Valley, Costa Rica.

The name sometimes is spelled *vinasana*.

20a. Peperomia vinasiana macrocarpa (C. DC.) Trel.

Peperomia macrocarpa C. DC. Candollea 1: 339. 1923.

TYPE LOCALITY: Las Vueltas, Province of Cartago, Costa Rica (*Tonduz* 13134, the type).

RANGE: Caribbean slope of Costa Rica.

21. Peperomia costaricensis C. DC. Bull. Soc. Bot. Belg. 30[1]: 228. 1891.

TYPE LOCALITY: División to Alto del Palmital, Costa Rica (*Pittier* 3602, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: Turrialba, *Tonduz* 8429.

Unique among Costa Rican Peperomias, except for the next species, in its fimbriate bracts.

22. Peperomia fimbribractea Trel., sp. nov.

A stoloniferous assurgent arboricolous herb; stem moderate (3 mm.), short-villous; leaves alternate, round- or subrhombic-elliptic, rather acute at both ends, moderate (2×3, 3×4, or 3.5 to 4×5 to 6 cm.), finely appressed-hairy on both faces, about 5 nerved by transmitted light; petiole 1 to 2 mm. long, villous; spikes terminal, 3×70 mm. or more, densely flowered; peduncle 2 cm. long, with spreading hairs; bracts round-peltate, ciliate; berries pale, globose, obliquely short-mucronate; stigma oblique on the mucro.

Type in the U. S. National Herbarium, no. 1,229,256, collected at Dulce Nombre, Province of Cartago, Costa Rica, altitude 1,400 meters, February 27, 1924, by Paul C. Standley (no. 35897).

RANGE: Upper Reventazón Valley.

COSTA RICA: El Muñeco, Río Navarro, *Standley* 33414, 33752; *Standley & Torres* 51704; *Standley & Valerio* 51659. Finca Las Cóncavas, *Standley* 41447. La Estrella, Cartago, *Standley* 39264. La Hondura, *Standley* 33363. Los Ayotes, near Tilarán, Guanacaste, *Standley & Valerio* 45481.

22a. Peperomia fimbribractea sparsipila Trel., var. nov.

Leaves elliptic- or round-obovate, with fewer and shorter hairs.

Type in the U. S. National Herbarium, no. 1,229,208, collected on Cerro de Piedra Blanca, near Escasú, Province of San José, Costa Rica, January 31, 1924, by Paul C. Standley (no. 32469).

RANGE: Central mountains of Costa Rica.

23. Peperomia jimenesana (C. DC.) Trel.

Peperomia caulibarbis jimenesana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

Peperomia glabella barbulata C. DC. Candollea 1: 325. 1923.

Peperomia melanostigma Auct., as to Costa Rica.

TYPE LOCALITY: Jiménez, Llanos de Santa Clara, Province of Limón, Costa Rica (*J. D. Smith* 4929, the type).

RANGE: Across central Costa Rica.

COSTA RICA: La Colombiana Farm, *Standley* 36930, 36939. La Concepción, *J. D. Smith* 6743. Shirores, *Pittier* 8220. Agua Dulce, *Pittier* 11034 (type of *P. glabella barbulata*). Guápiles, *Standley* 37435, 37436, 37477, 37489, 37499, 37510. El Arenal, *Valerio* 30; *Standley & Valerio* 45311. Pejivalle, *Standley & Valerio* 47311, 47320. El Muñeco, Río Navarro, *Standley* 33463, 33609. La Hondura, *Standley* 37969. Zurquí, *Standley & Valerio* 48306, 48342. San Isidro Coronado, *Alfaro* 32401 in part, 32402, 32404, 32405, 34005 in part. El General, *Pittier* 3399. Térraba, *Pittier* 3605 in part. About Tilarán, Guanacaste, *Standley & Valerio* 44282, 44282a, 44336, 44424, 44629, 44807, 45311, 45596, 45607, 46044.

24. Peperomia filicaulis C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

TYPE LOCALITY: Puerto Viejo and Sarapiquí River, Costa Rica (*Biolley* 7434, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Hamburg Finca, Cairo, *Standley & Valerio* 48862, 48880, 49900. Finca Montecristo, Cairo, *Standley & Valerio* 48985, 48988. La Colombiana Farm, *Standley* 36839.

25. Peperomia crispipetiola Trel., sp. nov.

A rather large, glabrous, arboricolous herb of the aspect of *P. glabricaulis;* stem moderate (3 mm.), rooting from the nodes; leaves alternate, broadly

elliptic, acuminate, acute-based, rather large (4 to 4.5×8 to 10 cm.), pinnately veined from near the base, the branches of the midrib about 3×2, dark-granular; petiole very short (3 mm.), crisp-winged to the base; spikes solitary, opposite the leaves, filiform, about 1×120 mm., rather loosely flowered; peduncle 1 cm. long; bracts round-ovate; berries globose, dark red, glandular; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,287, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37455).

RANGE: Caribbean piedmont of Costa Rica.

26. Peperomia carpinterana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 175. 1897.

TYPE LOCALITY: La Carpintera, Province of Cartago, Costa Rica (*Pittier & Tonduz* 6903, the type).

RANGE: Central mountains of Costa Rica.

26a. Peperomia carpinterana sparsipila Trel., var. nov.

A rather tall (1.5 meters) branching herb; stem rather stout (2 to 5 mm. or more), few-haired near the nodes; leaves alternate, round-elliptic or the uppermost lanceolate, acuminate, acute-based, rather large (2×5 to 4×6 cm.), 5 or the lower 7 nerved, paler and with the nerves villous beneath; petiole short (5 to 10 mm.), loosely villous on the back; spikes terminal and opposite the leaves, 2×70 mm. or more, loosely subverticillately flowered; peduncle about 5 mm. long, glabrous; bracts round- or elliptic-peltate; ovaries immersed, subovoid, subscutulate with the stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,229,254, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 to 1,850 meters, February, 1924 by Paul C. Standley (no. 35690).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley* 34402.

27. Peperomia herediana Trel., sp. nov.

An erect forking glabrous herb; stem moderate (3 to 5 mm.); leaves alternate, elliptic or lance-ovate, caudate, rather acute-based, moderate (2×5 to 3×6 cm.), drying rather opaque, 5 or 7 nerved, pale-granular beneath; petiole scarcely 5 mm. long, subalately decurrent; spikes axillary toward the top, filiform (1×60 mm. or more), red-green, rather loosely subannularly flowered; peduncle slender, 1 cm. long; bracts round-peltate; ovary obovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,293, collected at Yerba Buena, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 49260).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Type locality, *Standley & Valerio* 50200, 51696. Cerro de las Caricias, *Standley & Valerio* 52337, 52451.

28. Peperomia munyecoana Trel., sp. nov.

An openly branching, erect, glabrous, epiphytic herb; stem moderate (3 to 4 mm.), angular, silvery-exfoliating; leaves alternate, elliptic, subacute at both ends, rather large (2.5×5 to 3.5×7 cm.), drying firm and opaque, 5 or 7 nerved, with the inner nerves salient, paler and pale-granular beneath; petiole scarcely 7 mm. long, subalately decurrent; spikes terminal and opposite the leaves, 2 to 3×110 mm., green, rather closely flowered; peduncle 15 mm. long; bracts round-peltate; berries globose; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,352, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 to 1,500 meters, March 6, 7, 1926, by Paul C. Standley and Rubén Torres (no. 51754).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Standley & Torres* 51696; *Standley* 33698, 33701. 33949. Pejivalle, *Standley & Valerio* 47216.

29. Peperomia virillana Trel., sp. nov.

Peperomia nuda Auct., as to Costa Rica.

A very obscurely puberulous, apparently assurgent, delicate herb; stem slender (2 mm.); leaves alternate, broadly elliptic or elliptic-ovate, somewhat acuminate, rounded or the longer subacute at base, moderate (2 to 4×3 to 6 cm.), 3 or 5 nerved, drying very thin; petiole 5 to 10 or the lower 20 mm. long; spikes mostly terminal, very slender and long (1×120 to 150 mm. or more), loosely flowered; peduncle 1 to 2 cm. long; bracts round-peltate; ovary ovoid, submucronate; stigma subapical.

Type in the DeCandolle Herbarium, collected at San Juan, Río Virilla, Province of Cartago, Costa Rica, by A. Tonduz (no. 945b).

RANGE: High central divide of Costa Rica.

30. Peperomia vueltasana Trel., sp. nov.

A moderately small, assurgent, glabrous herb; stem rather slender (2 mm.), rooting from the lower nodes; leaves alternate, lanceolate or oblanceolate and gradually acute at both ends or somewhat mucronate, the lower reduced and bluntly obovate, moderate (2 to 3×4 to 6 cm.), drying thin, 5 nerved; petiole about 10 mm. long, slender; spikes terminal, moderately slender and elongate (2×50 to 80 mm.), closely flowered; peduncle 2 cm. long; bracts round-peltate; berries round-ovoid, obliquely mucronate; stigma anterior.

Type in the U. S. National Herbarium, no. 798,293, collected at Las Vueltas, Tucurrique, Province of Cartago, Costa Rica, altitude 700 meters, January, 1899, by A. Tonduz (no. 13130).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 12897. Orosi, *Standley* 39668.

31. Peperomia pseudopedicellata Trel., sp. nov.

A repent-assurgent, divaricately forking, glabrous, arboricolous herb; stem moderate (3 to 4 mm.); leaves alternate, lanceolate, sharp-acuminate, acute-based, moderate (1.5×5, 2×6, or 2.5 to 3×8 cm.), drying rather opaque, 5 nerved, with the 3 inner nerves salient, paler and pale-granular beneath; petiole 5 to 8 mm. long, subalately decurrent onto the stem; spikes terminal and from the upper axils, 2×90 to 100 mm., loosely flowered, the denuded rachis beset with pellucid pseudo-pedicels 1 or 1.5 mm. long; peduncle scarcely 10 mm. long; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,306, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37762).

RANGE: Central mountains of Costa Rica.

32. Peperomia dyscrita Trel., sp. nov.

Peperomia alata Auct., as to Costa Rica.

A moderately small, assurgent, glabrous herb; stem zigzag, slender (2 mm.), rooting from the lower nodes; leaves alternate, narrowly lanceolate, acutely long-attenuate at apex, acute-based, moderate (1.5 to 2×8 to 10 cm.), 5 or 7 nerved; petiole scarcely over 5 mm. long, decurrent from the margins; spikes terminal, filiform and rather long (1×80 mm.); peduncle scarcely 10 mm. long; bracts round-peltate.

Type in the herbarium of the Jardin Botanique de l'État, Brussels, collected at Río Naranjo, Province of Cartago, Costa Rica, by A. Tonduz (no. 7518).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 7512. Naranjo, *Oersted*. San Marcos, *Tonduz* 7957. Pejivalle, *Standley & Valerio* 47266, 47270. El Muñeco, Río Navarro, *Standley & Torres* 51687.

33. Peperomia pilulifera Trel., sp. nov.

A rather small, assurgent-erect, glabrous, arboricolous herb; stem rather slender (2 to 3 mm.); leaves alternate, lanceolate, or elliptic when reduced, gradually acute at apex and more abruptly at base, moderate (1×2.5 to usually 1.5 to 2×6 to 8 cm.), subpalmately 5 nerved with the midrib faintly branching, drying thin, conspicuously glandular-granular beneath; petiole scarcely 3 mm. long, winged to the base and clasping-decurrent; spikes opposite the leaves, scant 2×40 mm., somewhat loosely flowered, with short thick pseudo-pedicels; peduncle scarcely 1 cm. long; bracts round-peltate, moderately small; berries globose, red, somewhat granular; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,282, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37439).

RANGE: Caribbean piedmont of Costa Rica.

34. Peperomia niveo-punctulata Trel., sp. nov.

A rather small, tufted, erect, glabrous, arboricolous herb; stem slender (2 mm.); leaves lanceolate, gradually acute at both ends, moderate (1×4.5, 2×7, or 2.5×5.5 cm.), subpalmately 5 nerved with the midrib faintly branched, drying thin, closely pale-punctulate but not granular beneath; petiole about 5 mm. long, clasping-decurrent; spikes terminal or opposite the leaves, about 1×55 mm., somewhat loosely or subannularly flowered; peduncle 5 mm. long; bracts round-peltate, relatively large; berries globose, smooth, subapiculate; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,305, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37552).

RANGE: Caribbean piedmont of Costa Rica.

35. Peperomia montecristana Trel., sp. nov.

A small, somewhat tufted, arboricolous herb; stem slender (1 mm.), loosely long-villous; leaves alternate, ovate or elliptic-ovate, blunt-acuminate, rounded at base rather small (1.5×2 to 2×4 cm.); 5 nerved, appressed-hairy, especially on the paler lower side, drying green and membranous; petiole short (5 to 10 mm.); spikes terminal, 1×30 to 50 mm., loosely flowered; peduncle scarcely 5 mm. long, villous with straight hairs; bracts round-peltate, thin and large; ovary immersed, ovoid, scutulate; stigma anterior, on the scutulum.

Type in the U. S. National Herbarium, no. 1,251,288, collected at Finca Montecristo, Río Reventazón, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 49017).

RANGE: Caribbean lowlands of Costa Rica.

36. Peperomia san-joseana C. DC. Linnaea **37**: 372. 1872.

TYPE LOCALITY: About San José, Costa Rica (*Oersted* 952, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: San José, *Tonduz* 7226 (in some herbaria labeled as from Río Naranjo); *Standley* 41239. Camino de Hatillo, *Standley* 32156. San Pedro Montes de Oca to Curridabat, *Standley* ?32831, 41300. San Isidro Coronado, *Alfaro* 34004. Aguacaliente, *Pittier* 2553. Boruca, *Tonduz* 4809. Cabagra, *Tonduz* 6891. Siquirres, *Pittier* 4249. La Palma, ?*Standley* 33200, 38150. Golfito, ?*Pittier* 9907.

37. Peperomia chrysocarpa C. DC. Bull. Soc. Bot. Belg. 29[2]: 70. 1890; 30[1]: 227. 1891.

TYPE LOCALITY: About San José, Costa Rica (*Tonduz* 1384, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: San José, *Biolley* 58. Rancho Flores, *Tonduz* 2343. Cartago, *Cooper* 186 (J. D. Smith 5928). Santa María de Dota, *Standley* 41723, 41855; *Standley & Valerio* 43188, 43367a.

38. Peperomia psiloclada C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 176. 1897.

Peperomia psiloclada magnifolia C. DC. Candollea 1: 350. 1923.

TYPE LOCALITY: El Tablazo, Costa Rica (*Pittier* 8040, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Santiago, San Ramón, *Brenes* 14179. La Hondura, *Standley* 37763. Santa Rosa de Copey, *Tonduz* 12222 (type of *P. psiloclada magnifolia*), 12226, 12332. Yerba Buena, near San Isidro, *Standley & Valerio* 49273. Santa María de Dota, *Standley* 43098. Cerro de Piedra Blanca, Escasú, *Standley* 32470, 32531, 32616, 32658. San Sebastián, *Standley* 49377. La Verbena, *Standley* 32303. San Pedro Montes de Oca to Curridabat, *Standley* 32774. San Isidro Coronado, *Alfaro* 32401, 32405. San José, *Standley* 33308, 41203. La Ventolera, Volcán de Poás, *Standley* 34740. La Palma, ? *Standley* 38149.

39. Peperomia erythrophlebia Trel., sp. nov.

A rather small, somewhat clustered, erect, glabrous, arboricolous herb; stem 2 mm. thick, with short internodes, leafless below; leaves alternate, elliptic or elliptic-obovate, obtuse, acute-based, 6×11 to 10×15 mm., palmately 5 nerved with the midrib very obscurely branched, paler beneath with red nerves; petiole 1 to 2 mm. long; spikes terminal and from the upper axils, 2×25 to 45 mm., closely flowered; peduncle 10 to 15 mm. long; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,226, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33418).

RANGE: Upper Reventazón Valley, Costa Rica.

40. Peperomia versicolor Trel., sp. nov.

A small stoloniferous-erect glabrous epiphytic herb; stem 2 mm. thick, with short internodes; leaves alternate, lanceolate, acute at both ends, 1 to 1.5×2 to 3 cm., 3 or obscurely 5 nerved, thin-coriaceous, opaque, purple-red beneath; petiole 3 mm. long, clasping-decurrent; spikes terminal and axillary, as yet 1×20 mm.; peduncle 5 mm. long; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,235, collected at Pejivalle, Province of Cartago, Costa Rica, altitude 900 meters, February 7, 8, 1926, by Paul C. Standley and Juvenal Valerio (no. 47270).

RANGE: Reventazón Valley, Costa Rica.

41. Peperomia brachypus Trel., sp. nov.

A rather small, erect or recurving, glabrous, arboricolous herb; stem moderately slender (2 to 3 mm.), rooting from the nodes below; leaves alternate, lance-elliptic, acutish at both ends, moderate (1.5×4 to 2×6.5 cm.), fleshy, drying dull-olivaceous, 5 nerved; petiole short (scarcely 10 mm.), obscurely decurrent; spikes terminal, 2×70 to 80 mm., closely flowered, with short stout pseudo-pedicels; peduncle 10 to 15 mm. long; bracts round-peltate; berries globose, slightly apiculate; stigma subapical.

Type in the U. S. National Herbarium, no. 1,229,200, collected along the Camino de Hatillo, near San José, Province of San José, Costa Rica, altitude 1,200 meters, January 29, 1924, by Paul C. Standley (no. 32159).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Cartago, *Standley* 33323.

42. Peperomia stenophylla C. DC. Bull. Soc. Bot. Belg. 30[1]: 228. 1891.

TYPE LOCALITY: El General, Province of Puntarenas, Costa Rica (*Pittier* 3398, the type).

RANGE: Pacific mountains of Costa Rica.

COSTA RICA: At type locality, *Pittier* 3400.

42a. Peperomia stenophylla paradendrophila Trel., var nov.

Peperomia dendrophila Auct., as to Costa Rica.

A small stoloniferous glabrous herb; stem slender (1 to 2 mm.); leaves alternate, narrowly lanceolate or oblanceolate, equally acute at both ends or long-cuneate, rather small (1 to 1.5×3.5 to 4 cm.), 5 to 7 nerved, with the innermost nerves from above the base, pale beneath; petiole filiform, 5 to 10 mm. long; spikes terminal, moderately slender and elongate (1×25 to 40 mm.), closely flowered; peduncle filiform, elongate (2 cm.); bracts round-peltate; berries in pits separated by anastomosing ridges, round-ovoid, submucronate; stigma anterior.

Type in the U. S. National Herbarium, no. 798,282, collected at Tuis, Province of Cartago, Costa Rica, altitude 650 meters, November, 1897, by A. Tonduz (no. 11531).

RANGE: Caribbean slope of Costa Rica.

43. Peperomia stenophyllopsis Trel., sp. nov.

A small, essentially glabrous, stoloniferous-repent, arboricolous herb; leaves alternate, lanceolate or the larger elliptic, bluntly or emarginulately acuminate, acute at base, small (scarcely 1×3 to 1.5×4, or on sterile stems 1.5 to 2.5×4 to 5 cm.), 3 or 5 nerved, ciliolate upward or obscurely hairy; petiole 5 to 10 mm. long, clasping-decurrent; spikes terminal, slender, scarcely 30 mm. long; peduncle scant 1 cm. long; bracts round-peltate; berries globose, submucronulate; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,248, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47590).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley & Torres* 47667.

44. Peperomia fissispica Trel., sp. nov.

A diffuse, sparingly branched, terrestrial herb; stems slender (1 to 3 mm.), with shortened internodes upward, transiently upcurved-hirsute; leaves (fallen below) alternate, lance- to round-elliptic, subacute at both ends, rather small (0.6×1.2 to 1.5×3 cm.), rather coriaceous, indistinctly 1 or 3 nerved, evanescently hairy, paler and pale-granular beneath; petiole about 5 mm. long, somewhat hairy; spikes terminating short branches with reduced leaves, small (as yet 1×10 mm.), teratologically bifid, closely flowered; peduncle scarcely 5 mm. long, pubescent; bracts round-peltate, relatively large.

Type in the U. S. National Herbarium, no. 1,229,250, collected at Finca del Volcán de Turrialba, Costa Rica, altitude 2,000 to 2,400 meters, February 22, 1924, by Paul C. Standley (no. 35055).

RANGE: Central mountains of Costa Rica.

45. Peperomia multifida Trel., sp. nov.

A rather small, erect, repeatedly forking, glabrous, arboricolous herb; stem moderately slender (1 to 3 mm.); leaves mostly alternate but frequently opposite near the top, round-ovate, acute, rounded at base, rather small (1×1.2 to 1.5×1.8 cm.), coriaceous and opaque, obscurely 3 or 5 nerved, yellowish and

somewhat pale-granular beneath; petiole 3 to 5 mm. long, often clasping-decurrent; spikes several, terminal and from the upper axils, small (as yet scarcely 1×15 mm.); peduncle very short (3 mm.); bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,243, collected on Cerro de la Carpintera, Province of Cartago, Costa Rica, altitude 1,500 meters, February, 1924, by Paul C. Standley (no. 34349).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley* 34368, 34403, 34452, 35621. Las Nubes, *Standley* 38744, 38803.

46. Peperomia zurquiana Trel., sp. nov.

A rather small, repent or stoloniferous, glabrous, arboricolous herb; stem slender (scarcely 2 mm.), red; leaves alternate, elliptic to ovate or the lower orbicular, emarginately subacute, often acute at base, rather small (8×15 to 15×15 to 20 mm.), coriaceous and opaque, rather indistinctly 3 nerved, yellowish and granular beneath; petiole 5 mm. long; spikes terminal, elongate, loosely flowered; peduncle 5 mm. long; bracts subelliptic-peltate; ovary immersed, ovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,324, collected on Cerros de Zurquí above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 to 2,400 meters, March 3, 1926, by Paul C. Standley and Juvenal Valerio (no. 50758).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Yerba Buena, above San Isidro, *Standley & Valerio* 50211. Cerro de las Caricias, *Standley & Valerio* 52321, 52449.

47. Peperomia fraijanesana Trel., sp. nov.

A stoloniferous, erect, somewhat forking, glabrous herb; stem moderately slender (2 to 3 mm.), dark red; leaves alternate, round- or rhombic-elliptic or subobovate, rounded at apex or shortly blunt-acuminate, acute-based or cuneate, moderately small (1.5×2, 2×3, or 3×4 cm.), 5 nerved, drying rather thin but firm, the yellow lower surface for a time brown-punctulate; petiole 5 to about 10 mm. long; spikes noted as pale green.

Type in the U. S. National Herbarium, no. 1,251,249, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47596).

RANGE: Central mountains of Costa Rica.

47a. Peperomia fraijanesana subrhombica Trel., var. nov.

A rather small, erect, pseudo-dichotomous, glabrous, arboricolous herb; stem moderately slender (1 to 3 mm.), dark red; leaves alternate, subrhombically obovate, obtuse, acute at base, rather small (1×1.8 to 1.5×2 to 2.5 cm.), coriaceous and opaque, 3 or 5 nerved, yellow and obscurely granular beneath; petiole about 5 mm. long, clasping-decurrent; spikes terminal and from the uppermost axils, as yet young and very small; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,251, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47602).

RANGE: Mountains of central Costa Rica.

47b. Peperomia fraijanesana san-isidroana Trel., var. nov.

A rather small, erect, repeatedly forking, arboricolous herb; stem moderate (1 to 2 or at base 4 mm. thick), red, with mostly short sulcate internodes, transiently and sparsely soft-villous or cobwebby; leaves alternate or (exceptionally) subopposite at the branching nodes, subrhombically elliptic, obtuse, acute at base, rather small (1×1.5 to scarcely 2×3 cm.), coriaceous and opaque,

3 nerved, yellow and obscurely granular beneath; petiole 5 to 10 mm. long, clasping-decurrent; spikes terminal and axillary, as yet small; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,318, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50226).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 49274, 50139. Cerro de las Caricias, above San Isidro, *Standley & Valerio* 52454.

48. Peperomia tuisana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 176. 1897.

TYPE LOCALITY: Tuis, Province of Cartago, Costa Rica (*Tonduz* 8222, the type).

RANGE: Caribbean slope of Costa Rica.

49. Peperomia chlorostachya Trel., sp. nov.

A moderately small, repent, arboricolous herb; stem slender (1 to 2 mm.), rooting from the nodes, at first velvety; leaves alternate, round-ovate, acute, rounded or cordulately subtruncate at base, rather small (1.2×1.5 to 1.5×2 cm.), coriaceous and opaque, 1 nerved, yellowish and obscurely granular beneath, velvety at least on the midrib; petiole 5 to 15 mm. long, at first velvety; spikes terminal, small (scarcely 2×20 mm.), rather closely flowered, with some pseudo-pedicels; peduncle 15 mm. long, velvety; bracts round-peltate; anthers inconspicuous; ovary ovoid, submucronate; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,176, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 43513).

RANGE: High central mountains of Costa Rica.

COSTA RICA: Finca La Cima, near El Copey, *Standley* 42766.

50. Peperomia hylophila C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 176. 1897.

Peperomia irazuana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 180. 1897.

TYPE LOCALITY: La Carpintera, Province of Cartago, Costa Rica (*Pittier* 4406, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Pittier* 4407, 4408 (type of *P. irazuana*); *Polakowsky* 206, 207. Mount Barba, *Hoffmann* 56. Vara Blanca to La Concordia, between Volcán de Poás and Volcán de Barba, *Maxon & Harvey* 8416. El Muñeco, Río Navarro, *Standley & Torres* 51721. Las Nubes, *Standley* 38548, 38630, 38743. La Palma, *Standley* 38031, 38232.

50a. Peperomia hylophila personata Trel., var. nov.

Rather small, assurgent, forking, glabrous; leaves congested upward, elliptic-obovate, obtuse or emarginulate, acute at base or cuneate, 1 to 1.5×2.5 cm., 3 nerved, coriaceous, drying yellow beneath and granular; spikes scarcely 2×35 mm.; peduncle 5 mm. long.

Type in the U. S. National Herbarium, no. 796,619, collected on Volcán de Poás, Province of Alajuela, Costa Rica, altitude 2,300 meters, March, 1896, by John Donnell Smith (no. 6744).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Palma, *Standley* 32933.

51. Peperomia tenellaeformis Trel., sp. nov.

A small stoloniferous epiphytic herb; stem slender (1 mm.), glabrous, with short internodes: leaves alternate, oblong-subovate, rather obtuse at both ends

or acutish at base, small (3 to 4×8 to 12 mm.), 3 nerved, rather firm, somewhat pubescent near the margin; petiole 2 to 3 mm. long, clasping-decurrent, glabrous; spikes terminal, 1×35 mm., loosely flowered with pseudo-pedicels; peduncle scant 10 mm. long, glabrous; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,229,218, collected at La Palma, Province of San José, Costa Rica, altitude 1,600 meters, February 3, 1924, by Paul C. Standley (no. 33135).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Yerba Buena, above San Isidro, ? *Standley & Valerio* 50206 in part.

52. Peperomia tenuicaulis C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 177. 1897.

TYPE LOCALITY: Santo Domingo de Golfo Dulce, Province of Puntarenas, Costa Rica (*Pittier* 9986, the type; also distributed as J. D. Smith 7147).

RANGE: Pacific lowlands of Costa Rica.

COSTA RICA: Type locality, *Pittier* 10089; distributed also as J. D. Smith 7258.

53. Peperomia punctataefolia Trel., sp. nov.

A small arboricolous repent-assurgent herb; stem filiform, rooting below, loosely hairy; leaves alternate, elliptic or the lowest suborbicular, obtuse, rounded or acute at base, flat, small (3×4 to 4 or 5×10 to 12 mm.), at least transiently loosely hairy on both sides, more or less punctulate, obscurely 1 to 3 nerved by transmitted light; petiole 1 to 2 mm. long; spikes 1 to 2×20 to 25 mm., at length rather loosely flowered; peduncle loosely hairy, very slender, 5 to 10 mm. long; bracts round-peltate; ovary obovoid, bluntish; stigma oblique.

Type in the U. S. National Herbarium, no. 1,229,311, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37968).

RANGE: Caribbean slope of Costa Rica and in the central mountains.

COSTA RICA: At type locality, *Standley* 33364, 36287, 37843. Aserrí to Tarbaca, *Standley* 34198. Laguna de la Escuadra, *Standley* 42038. Guápiles, at 300 to 500 meters altitude, ? *Standley* 37437, 37500, 37509.

53a. Peperomia punctataefolia munyecoana Trel., var. nov.

Resembling the type, but in its more creeping form approaching *P. rotundifolia* in having nearly orbicular leaves.

Type in the U. S. National Herbarium, no. 1,229,227, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33432).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Standley* 33465, 33488, 33606, 33702; *Standley & Torres* 51669, 51722, 51735.

54. Peperomia tonduzii C. DC. Bull. Soc. Bot. Belg. 29^2: 70. 1890; 30^1: 229. 1891.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Pittier* 566, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Finca La Cima, near El Copey, *Standley* 42746. Laguna de la Chonta, near Santa María de Dota, *Standley* 42311.

55. Peperomia oerstedii C. DC. Linnaea **37**: 375. 1872.

TYPE LOCALITY: Volcán de Irazú, Costa Rica (*Oersted* 977, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Quebradillas, near Santa María de Dota, *Standley* 43103.

55a. Peperomia oerstedii punctata (C. DC.) Trel.

Peperomia punctata C. DC. Candollea 1:331. 1923; 2:188. 1925.

TYPE LOCALITY: Turrialba, Province of Cartago, Costa Rica (*Pittier* 13376, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: Juan Viñas, *Cook & Doyle* 394. Pejivalle, *Standley & Valerio* 47319. Talamanca Valley, *Rowlee* 354.

56. Peperomia silvivaga C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 177. 1897.

Peperomia serpens Auct., as to Costa Rica.

TYPE LOCALITY: Forests of Turrialba, Province of Cartago, Costa Rica, altitude 570 meters (*Tonduz & Pittier* 8435, the type).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Tonduz & Pittier* 4246, 8434.

57. Peperomia incisa Trel., sp. nov.

A rather small, repent, glabrous, arboricolous herb; stem filiform; leaves alternate, obovate or oblong-obovate, notched, acute at base, small (5×7 to 7×13 mm.), opaque, indistinctly 3 nerved, impressed-punctulate beneath; petiole 3 to 5 mm. long; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,251,223, collected at Quebrada Serena, near Tilarán, Province of Guanacaste, Costa Rica, altitude 700 meters, January 27, 1926, by Paul C. Standley and Juvenal Valerio (no. 46318).

RANGE: Pacific slope of Costa Rica.

58. Peperomia rotundifolia (L.) H. B. K. Nov. Gen. & Sp. 1: 65. 1815.

Piper rotundifolium L. Sp. Pl. 30. 1753.

Piper nummularifolium Swartz, Prodr. Veg. Ind. Occ. 16. 1788.

Peperomia nummularifolia H. B. K. Nov. Gen. & Sp. 1: 66. 1815.

TYPE LOCALITY: Martinique.

RANGE: Widespread in differing forms through the West Indies, except for the Virgin Islands group, and on the mainland from Mexico to central South America. The type of *Piper rotundifolium* is from Martinique, and that of *Piper nummularifolium* from Jamaica. The specimens which Kunth identified with *P. rotundifolium* came from Caripe, Venezuela.

COSTA RICA: Río Hondo, plains of Santa Clara, *Cook & Doyle* 608. Victoria, Plains of Zent, *Pittier* 16083. Shirores, *Pittier* 9281. La Colombiana Farm, *Standley* 36838, 36938. Hamburg Finca, *Standley & Valerio* 48863, 48881, 48901, 48935. Finca Montecristo, *Standley & Valerio* 48989, 49022. El Muñeco, Rio Navarro, ?*Standley & Torres* 51402. La Estrella, Cartago, ?*Standley* 39242, 39257, 39593. Carrillo Road, *Pittier* "566." Río Zhorquín, *Tonduz* 8526. Las Vueltas, *Tonduz* 13131. Río Naranjo, *Tonduz* 8046. Mount Aguacate, *Oersted* 995. La Palma, *Pittier* 723. El Arenal, Guanacaste, *Standley & Valerio* 45316. About Tilarán, Guanacaste, ?*Standley & Valerio* 44830, 44975a; *Valerio* 53.

59. Peperomia rejecta Trel., sp. nov.

A repent arboricolous herb with short erect branches; stem filiform, sparsely velvety; leaves alternate, orbicular or broad-elliptic, sometimes emarginulate, usually subacute at base, small (6×8 to 8×12 mm.), drying green but rather opaque, more or less evidently 3 nerved, very evanescently and sparsely velvety; petiole filiform, 4 to 10 mm. long, somewhat velvety; spikes terminal, as yet young and small (1×5 mm.); peduncle slender, scarcely equaling the spike, puberulent; bracts round-peltate.

Type in the U. S. National Herbarium, no. 1,251,316, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50219).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 50248.

60. **Peperomia delecta** Trel., sp. nov.

A repent arboricolous herb; stem filiform, rooting and with short branches from many nodes, somewhat sparsely velvety; leaves alternate, broadly elliptic or suborbicular, very obtuse and often emarginulate, usually rounded at base, rather small (8×10 to 15×15 mm.), drying thin and green, faintly 3 nerved, for a time with sparse fine appressed hairs; petiole 3 to 10 mm. long, velvety; spikes terminal, scarcely 1×10 mm., rather closely flowered; peduncle filiform, about equaling the spike, slightly velvety; bracts round-peltate, like the anthers comparatively large.

Type in the U. S. National Herbarium, no. 1,229,324, collected at Alto de la Estrella, Province of Cartago, Costa Rica, March 26, 27, 1924, by Paul C. Standley (no. 39097).

RANGE: Upper Reventazón Valley, Costa Rica.

61. **Peperomia cryptolepida** Trel., sp. nov.

A moderately small, repent, arboricolous herb; stem filiform, rooting from the nodes, transiently minutely puberulent; leaves alternate, broadly elliptic ranging to orbicular and subobovate, obtuse, somewhat acute-based, small (1×1 to 2×2.5 cm.), thin, dark green, 3 or 5 nerved by transmitted light, very obscurely puberulous; petiole 5 to 10 mm. long, puberulous; spikes terminal, small (scarcely 2×10 to 15 mm.), at first closely flowered; peduncle filiform, about 10 mm. long, glabrate; anthers pale, large, concealing the round-peltate bracts in anthesis.

Type in the U. S. National Herbarium, no. 1,251,287, collected at Hamburg Finca, Río Reventazón, below Cairo, Province of Limón, Costa Rica, altitude 55 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 48932).

RANGE: Caribbean lowlands, Costa Rica.

COSTA RICA: Finca Montecristo, in the same region, *Standley & Valerio* 49016.

62. **Peperomia megalanthera** Trel., sp. nov.

A moderately small, repent, arboricolous herb; stem slender (1 to 2 mm.), rooting from the nodes, puberulent; leaves alternate, orbicular or broadly elliptic or ovate, rounded at both ends, rather small (1×1 to 2×2 or 2.5 cm.), coriaceous and opaque, 1 or very obscurely 3 or 5 nerved, essentially glabrous; petiole 3 to 12 mm. long, puberulent; spikes terminal, small (2×20 mm.), densely flowered; peduncle 6 mm. long, puberulent; bracts round- or elliptic-peltate; anthers pale, broad, 0.5 mm. long; ovary obovoid; stigma anterior.

Type in the U. S. National Herbarium, no. 1,229,313, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37970).

RANGE: Central mountains of Costa Rica.

63. **Peperomia reptabunda** Trel., sp. nov.

A small creeping glabrous herb; stem slender (1 mm.); leaves alternate, round-obovate, frequently emarginulate, acute at base or cuneate, 1×1.5 to 2.5 cm., drying dull and coriaceous, 5 nerved, with the midrib somewhat branched; petiole 5 to 10 mm. long; spikes terminal, 1×30 mm., closely flowered; peduncle slender, 2 cm. long; bracts round-peltate; berries globose; stigma subapical.

Type in the U. S. National Herbarium, 798,443, collected at Las Vueltas, Tucurrique, Province of Cartago, Costa Rica, altitude 635 meters, by A. Tonduz (no. 12791).

RANGE: Caribbean slope of Costa Rica.

64. Peperomia san-ramonensis C. DC. Candollea 1: 332. 1923; 2: 188. 1925.

TYPE LOCALITY: Santiago, San Ramón, Province of Alajuela, Costa Rica (*Brenes* 14183, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: At type locality, *Brenes* 14181, 14185, 14186, 14534.

64a. Peperomia san-ramonensis atricha Trel., var. nov.

A minute plant with even the stem glabrous, that of the type being somewhat pubescent.

Type in the U. S. National Herbarium, no. 1,080,173, collected at Santiago, San Ramón, Province of Alajuela, Costa Rica, altitude 1,200 to 1,300 meters, June 2, 1901, by A. M. Brenes (no. 14191).

RANGE: Pacific slope of Costa Rica.

65. Peperomia congestifolia Trel., sp. nov.

A small, repent, essentially glabrous, arboricolous herb; stem filiform, frequently forking, with very short erect leafy branches; leaves alternate, few but crowded, round-obovate and rounded at both ends or broadly spatulate-cuneate, small (5 to 8×7 to 10 or 13 mm.), obscurely 1 nerved, coriaceous; petiole 3 mm. long, winged, sometimes slightly papillate; spikes terminal, minute (1×8 mm.), closely flowered; peduncle very slender, equaling the spike; bracts round-peltate; berries globose, slightly apiculate and subcalcyculate; stigma oblique on the point.

Type in the U. S. National Herbarium, no. 1,229,294, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37490).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: At type locality, *Standley* 37438.

66. Peperomia candelaber Trel., sp. nov.

A small, repent-assurgent, often arboricolous herb; stem slender (1 to 2 mm.), short, rooting below, sparsely velvety; leaves alternate, broadly elliptic, varying to round or ovate, typically obtuse at both ends, small (7×10 to 14×17 mm.), 3 nerved, obscurely puberulent beneath; petiole 3 to 6 mm. long, somewhat puberulent; spikes terminal and from several of the upper axils, divergent-upcurved, about 1×20 mm., rather loosely flowered, at length with pseudo-pedicels; peduncle filiform, about 5 mm. long, glabrate; bracts relatively large, round-peltate; berries subglobose, short-apiculate; stigma nearly terminal, slightly lobed.

Type in the U. S. National Herbarium, no. 1,229,215, collected at La Palma, Province of San José, Costa Rica, altitude 1,600 meters, February 3, 1924, by Paul C. Standley (no. 33010).

RANGE: High central divide of Costa Rica.

COSTA RICA: At type locality, *Standley* 33206, 33230.

67. Peperomia calyculata Trel., sp. nov.

A small, repent-assurgent, arboricolous herb; stem filiform, sparsely and transiently velvety; leaves alternate, broadly elliptic or the lowest subobovate, obtuse, mostly blunt-based, small (8×10 to 11×19 mm.), coriaceous, 5 nerved, glabrous, yellowish beneath; petiole scant 5 mm. long, velvety; spikes terminal or also from the upper axils, 2×15 to 20 mm., closely flowered; peduncle stout, 5 mm. long, glabrous; bracts round-peltate; berries globose, surrounded

by a membranous, about 6-lobulate cup; stigma apical, sessile, minute, somewhat lobed.

Type in the U. S. National Herbarium, no. 1,229,260, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 2–4, 1924, by Paul C. Standley (no. 36568).

RANGE: Central mountains of Costa Rica.

Unique in *Peperomia* in its (normally?) calyculate flowers and minute apical stigma.

68. Peperomia poasana C. DC. Bull. Soc. Bot. Belg. 30 [1]: 224. 1891.

TYPE LOCALITY: Volcán de Poás, Costa Rica (*Pittier* 63, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Estrella, Cartago, *Cooper* 288, distributed as J. D. Smith 5922. La Palma, *Maxon* 360.

68a. Peperomia poasana herediana Trel., var. nov.

Leaves scarcely punctulate; midrib rosy; petiole clasping; peduncle rather stout.

Type in the U. S. National Herbarium, no. 1,251,310, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50197).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 50247. Cerro de Zurquí, *Standley & Valerio* 50857. Zurquí, *Standley & Valerio* 48323.

69. Peperomia brevicaulis Trel., sp. nov.

A moderately large, essentially glabrous, rhizomatous, arboricolous herb, with short erect few-leaved branches; stem stout (4 mm.); leaves alternate, lance-elliptic, acute at both ends, rather large (4 to 6×12 to 15 cm.), drying rather thin and dull, pinnately veined nearly throughout, the branches of the midrib about 5×2; petiole elongate (3 to 6 cm.), winged; spikes verticillate on solitary stalks scarcely 7 cm. long, small (1×10 to 20 mm.), obtuse; peduncles rather stout, scarcely 5 mm. long; bracts round-peltate; berries red, ellipsoid, subtruncate; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,229,328, collected at Orosi, Province of Cartago, Costa Rica, March 30, 1924, by Paul C. Standley (no. 39667).

RANGE: Upper Reventazón Valley, Costa Rica.

COSTA RICA: El Muñeco, in the same general region, altitude 1,400 meters, *Standley* 33837, 33926.

70. Peperomia atirroana Trel., sp. nov.

Peperomia paniculata Auct., as to Central America.

A sparingly puberulent, erect, subsimple herb growing on the ground; stem moderately stout (3 to 4 mm.), dull; leaves alternate, obovate-elliptic, characteristically obtuse, gradually narrowed below and decurrent on the petiole, large (6 to 9×12 to 18 or 21 cm.), slightly glossy, coriaceous, pinnately nerved nearly to the end, the branches of the midrib about 5×2, slightly revolute; petiole elongate (6 to 9 or 12 cm.), winged; spikes verticillately clustered about the upper part of elongate stout leafless branches, relatively thick and short (some 2 or 10 to 15 mm.), obtuse; peduncles very short (scarcely 5 mm.); bracts round-peltate; berries oblong, red, somewhat granular, rather abruptly narrowed to the apical stigma.

Type in the U. S. National Herbarium, no. 796,689, collected at Atirro, Province of Cartago, Costa Rica, altitude 600 meters, March, 1894, by John Donnell Smith (no. 4927).

RANGE: Reventazón Valley, Costa Rica.

71. Peperomia breviscapa Trel., sp. nov.

A rather large, obscurely papillose, short-stemmed, arboricolous herb; stem rather stout (5 mm.); leaves few, alternate, elliptic-oblong to elliptic-obovate, obtuse, gradually narrowed onto the petiole, large (8 to 11×25 to 30 cm.), slightly glossy, drying rather papery, pinnately nerved nearly to the end, the branches of the midrib about 10×2; petiole elongate (some 6 cm.), winged; spikes verticillately clustered about the upper part of elongate reddish branches (3 to 7 cm. long), greenish-white, 10 to 15 mm. long, obtuse; peduncles very short (scarcely 5 mm.); bracts round-peltate; berries oblong, red, somewhat granular, obliquely subtruncate; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,229,268, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36888).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: At type locality, *Standley* 36754. Finca Montecristo, below Cairo, *Standley & Valerio* 48983.

72. Peperomia subacaulis Trel., sp. nov.

Peperomia longifolia Auct., as to Costa Rica.

A very short-stemmed, essentially glabrous herb; leaves lanceolate or oblanceolate, acute, gradually narrowed to the very short (10 mm.) petiole, large (5 to 5.5×25 cm.), pinnately nerved to the upper fourth, the branches of the midrib about 5×2; spikes verticillately subpaniculate on sometimes branched axillary stalks scarcely 5 cm. long below the spikes, the subpuberulous floriferous part nearly twice as long, small (scarcely 2×20 mm.), closely flowered; bracts small, round-peltate; berries ellipsoid, beakless; stigma essentially apical.

Type in the U. S. National Herbarium, no. 796,635, collected at Suerre, Llanuras de Santa Clara, Province of Limón, Costa Rica, altitude 300 meters, April, 1896, by John Donnell Smith (no. 6748).

RANGE: Caribbean piedmont of Costa Rica.

COSTA RICA: Guápiles, *Standley* 37466, 37488.

73. Peperomia sessilifolioides C. DC. Candollea 1: 409. 1923.

Peperomia sessilifolia C. DC. Candollea 1: 290. 1923. Not H. B. K.

TYPE LOCALITY: Río Naranjo, Costa Rica (*Pittier* 7835, the type).

RANGE: Caribbean lowlands of northern Costa Rica.

COSTA RICA: At type locality, *Pittier* "7625."

74. Peperomia venabulifolia Trel., sp. nov.

A moderate-sized erect glabrous arboricolous herb, forking at base; stem moderately stout (4 mm.); leaves alternate, narrowly oblanceolate, long-pointed, cuneate, sessile, 3×12 to 16 cm., pinnately veined from below the upper third, the branches of the midrib some 6 to 8×2; spikes rather few, 2 or 3 at each upper node of a slender stalk some 10 cm. long, elongate (2×100 mm. or more), rather closely flowered; peduncle scarcely 5 mm. long; bracts round-peltate; ovaries immersed; stigma anterior.

Type in the U. S. National Herbarium, no. 1,229,308, collected at La Hondura, Province of San José, Costa Rica, altitude 1,300 to 1,700 meters, March 16, 1924, by Paul C. Standley (no. 37774).

RANGE: Mountains of central Costa Rica.

75. Peperomia lancilimba C. DC. Candollea 1: 290. 1923; 2: 188. 1925.

Peperomia lancifolia Auct., as to Costa Rica.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Hoffmann* 61, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Palma, *Standley* 33081, 33201. Cerro de la Carpintera, *Standley* 34367, 34426, 35686. Zurquí, *Standley & Valerio* 48322. Yerba Buena,

above San Isidro, *Standley & Valerio* 50192, 50209. Cerro de las Caricias, above San Isidro, *Standley & Valerio* 52310, 52463; passing into a more elongate leaf-form, f. *elongata*, through no. 52459.

76. Peperomia guapilesiana Trel., sp. nov.

A rhizomatous erect herb; stem moderately stout (5 mm.), yellowish-villous; leaves alternate, elliptic, rather blunt at both ends, large (3.5×5, 5×8, or 6×12 cm.), dull, granular, paler beneath and villous, especially on the nerves, pinnately veined from below the upper third, the branches of the midrib about 5×2; petiole very villous, short (2 cm.); spikes loosely verticillate at the nodes of a somewhat compound, very villous panicle about 15 cm. long on an equilong stalk, rather small (scarcely 2×30 to 35 mm.), blunt; peduncle short (5 mm.), villous; bracts rounded-peltate; berries elongate-obovoid, pale-brown, not beaked; stigma oblique.

Type in the U. S. National Herbarium, no. 1,229,284, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37446).

RANGE: Caribbean piedmont, Costa Rica.

COSTA RICA: At type locality, *Standley* 37549.

77. Peperomia queserana Trel., sp. nov.

Peperomia adscendens Auct., as to Costa Rica.

A glabrous epiphyte; stem coarse; leaves alternate, oblanceolate, acute, gradually tapered to the base, large (7 to 8×15 to 20 cm.), pinnately veined; petiole 3 to 5 cm. long; spike solitary at end of a 1-bracted stalk, 2 to 4×100 to 150 mm.; peduncle 15 mm. long; bracts round-peltate; berries subglabrous, truncate; stigma apical.

Type in the U. S. National Herbarium, no. 796,536, collected at La Quesera, Roble de Copey, near El Copey, Province of San José, Costa Rica, altitude 2,700 meters, April, 1898, by A. Tonduz (no. 12184).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Laguna de la Escuadra, near El Copey, *Standley* 41955, 42019. Volcán de Barba, *Tonduz* 2200, "2209"; "*Pittier* 3309." Volcán de Irazú, *Tonduz* 4404, 6905. Volcán de Poás, *J. D. Smith* 6745. El General, *Tonduz* 3403.

78. Peperomia pothifolia Trel., sp. nov.

A rather large, erect, arboricolous herb; stem moderately stout (4 to 5 mm.), rather obscurely soft-hairy; leaves alternate, broadly elliptic, abruptly short-acuminate, obtuse at base, rather large (9 to 10×15 to 18 cm.), pinnately veined throughout, the branches of the midrib some 10 or 12×2, somewhat soft-hairy toward the base; petiole elongate (4 to 7 cm.), obscurely soft-hairy; spikes in a loose terminal panicle, slender and elongate (2×100 mm.), rather loosely subverticillately flowered; peduncle almost suppressed; bracts round-peltate; ovaries rounded, scutulate; stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,229,276, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37427).

RANGE: Caribbean piedmont, Costa Rica.

COSTA RICA: At type locality, *Standley* 37450, 37545.

79. Peperomia substriata C. DC. Candollea 1: 291. 1923; 2: 188. 1925.

TYPE LOCALITY: La Palma, Province of San José, Costa Rica (*Tonduz* 12473, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Volcán de Irazú, *Pittier* 4405.

80. Peperomia glabricaulis C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897.

TYPE LOCALITY: Tsuritkub, Costa Rica (*Tonduz* 8689, the type).

RANGE: Caribbean slope of Costa Rica.

81. Peperomia longibacca C. DC. Candollea 1: 369. 1923; 2: 188. 1925.

TYPE LOCALITY: Nicoya, Costa Rica (*Tonduz* 13958, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: Cabagra, *Tonduz* 6531. Tilarán, Guanacaste, *Standley & Valerio* 44958, 44226.

Wrongly ascribed to Ecuador.

82. Peperomia orientalis Trel., sp. nov.

A rather large arboricolous herb, closely resembling *P. longibacca;* stem rather slender, glabrous; leaves alternate, elliptic or lance-oblong, acuminate, rather obtuse at base, large (3.5 to 5×10 to 11 cm.), about 5 nerved from below the middle, more or less brown-villous on the nerves beneath; petiole 5 to 10 mm. long, glabrescent; spikes 2, terminal on a short-bracted stalk, slender and elongate (2×100 mm.); peduncle 1 cm. long, glabrous; bracts round-peltate; berries subcylindric, obliquely truncate with acutely protracted scutulum; stigma central on the scutulum.

Type in the U. S. National Herbarium, no. 1,229,274, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36943).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: Finca Montecristo, *Standley & Valerio* 48959, 49009, 49013. Hamburg Finca, *Standley & Valerio* 48883. Guápiles, *Standley* 37476. El Arenal, Guanacaste, *Valerio* 87. Río Hondo, Santa Clara, *Cook & Doyle* 548. Santa Clara, Las Delicias, *Biolley* 10655.

83. Peperomia naranjoana C. DC. Linnaea 37: 378. 1872.

TYPE LOCALITY: Naranjo, Cartago, Costa Rica (*Oersted* 974, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

The name sometimes is spelled *narangoana.*

84. Peperomia glaberrima C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897.

Peperomia glabriramea C. DC. Candollea 1: 370. 1923; 2: 188. 1925.

TYPE LOCALITY: Santo Domingo de Golfo Dulce, Province of Puntarenas, Costa Rica (*Tonduz* 9943, the type).

RANGE: Pacific lowlands of southern Costa Rica.

COSTA RICA: At type locality, *Tonduz* 9533 (J. D. Smith 7148). Buenos Aires, *Pittier* 6525, 6531.

The name as first published was intended to be *glabriramea.*

85. Peperomia circumscissa Trel.

Peperomia pendula C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 178. 1897. Not *P. pendula* Willd.

TYPE LOCALITY: Turrialba, Province of Cartago, Costa Rica (*Pittier* 8433, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Atirro, *J. D. Smith* 6741. Las Vueltas, *Tonduz* 13132.

86. Peperomia tilarana Trel., sp. nov.

A moderately large, repent, arboricolous herb; stem moderate (3 to 4 mm.), somewhat hairy about the nodes; leaves alternate, elliptic, blunt-acuminate, subacute at base, moderate (2×3 to 3×5 cm.), drying coriaceous and opaque, pinnately 5 or 7 nerved from the lower part, somewhat pubescent beneath and

ciliate at base; petiole short (5 mm.), hirsute; spikes terminal, moderately elongate (12×60 mm. or more), closely flowered; peduncle 2 cm. long; bracts round-peltate; berries red, spreading, oblong, truncately scutulate; stigma median on the scutulum.

Type in the U. S. National Herbarium, no. 1,251,191, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January, 1926, by Paul C. Standley and Juvenal Valerio (no. 44217).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 44349, 44394.

87. Peperomia borucana C. DC. Bull. Soc. Bot. Belg. 30[1]: 232. 1891.

TYPE LOCALITY: Boruca, Province of Puntarenas, Costa Rica (*Tonduz* 4109, the type).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: El General, *Pittier* 10559.

88. Peperomia parmata Trel., sp. nov.

Peperomia variegata Auct., as to Costa Rica.

Peperomia maculosa Auct., as to Costa Rica.

A rather large, assurgent, glabrous herb; stem stout (5 mm.); leaves few, alternate, peltate above the shallowly concave base, ovate, abruptly short-acuminate, large (11×16 cm.), drying dull and opaque, obscurely multiple-nerved, the midrib on each side with about 4 basal branches and as many more distributed below the upper third; petiole long (12 cm.) and stout; spikes terminal and axillary, large (5×200 mm.), tapering, closely flowered, on stalks about 3 cm. long bearing 1 or 2 linear bracts about 3×80 mm.; peduncle 3 cm. long, bracts round-peltate; ovaries in rounded pits; berries granular, black, ovoid, beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 796,648, collected along the Río Turrialba, Province of Cartago, Costa Rica, altitude 500 meters, March, 1894, by John Donnell Smith (no. 4926); through a crossing of labels distributed and listed as *P. magnoliaefolia*.

RANGE: Central mountains and Caribbean slope of Costa Rica.

COSTA RICA: Finca Las Cóncavas, *Standley* 41535. Santa María de Dota, *Standley & Valerio* 41761, 44103. Escasú, *Standley* 32502. La Palma, *Standley* 33105. Cervantes, *Noguera* 11031. Juan Viñas, *Pittier* 2010. Llanos de Alajuelita, *Tonduz* 1890.

89. Peperomia ciliifera Trel.

Peperomia hernandifolia ciliifera Trel. Bot. Gaz. 73: 145. 1922.

A rather large, repent, glabrate, sometimes arboricolous herb; stem 3 to 4 mm. thick; leaves alternate, broadly ovate, acuminate, peltate, 6×9 to 10×15 cm., ciliate, coriaceous, obscurely about 9 nerved; spikes single in the axils on a 1 bracted peduncle 3 to 6 cm. long, moderately large (3×100 mm.), closely flowered; bracts round-peltate; berries ellipsoid, granular-roughened, with recurved beak; stigma anterior at base of the beak.

TYPE LOCALITY: La Estrella, Province of Cartago, Costa Rica (*Cooper* 286, distributed by John Donnell Smith as no. 5917, type; labeled *Piper tuberculatum*). Type in U. S. National Herbarium.

RANGE: Mountains of central Costa Rica.

COSTA RICA: La Hondura, San José, *Standley* 37827; *Standley & Valerio* 51911, 51930.

89a. Peperomia ciliifera filipes Trel.

Peperomia hernandifolia filipes Trel. Bot. Gaz. 73: 145. *pl. 4, f. 18.* 1922.

Somewhat smaller, and with smaller spikes on slenderer stalks.

TYPE LOCALITY: La Palma, San José, Costa Rica (*Tonduz* 12539, the type, in U. S. National Herbarium).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley* 33105.

90. Peperomia peltilimba C. DC.; Trel., Bot. Gaz. **73**: 145. 1922; Candollea **1**: 373. 1923.

TYPE LOCALITY: San Ramón, Province of Alajuela, Costa Rica (*Brenes* 14178, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Hondura, *Standley* 37828. Pejivalle, *Standley & Valerio* 47272. El Muñeco, Río Navarro, *Standley* 33519, 33700; *Standley & Valerio* 51649.

91. Peperomia acutilimba C. DC., sp. nov.

An assurgent or erect glabrous herb; stem rather slender (3 mm.) upward, much thicker below; leaves alternate, oblanceolate, sharply acuminate, cuneate, rather large (3.5 to 4×8 to 11 cm.), pinnately veined, the branches of the midrib about 8×2, lighter green beneath; petiole 5 to 10 mm. long; spikes panicled on slender bracted axillary stalks 4 to 8 cm. long, rather small (1×50 to 60 mm.), loosely flowered; peduncle 5 mm. long; bracts round-peltate; ovaries elongate-ovoid, in deep pits, filiform-beaked; stigma anterior, at base of the beak.

Type in the herbarium of the Jardin Botanique de l'État, Brussels, collected on Volcán de Poás, Costa Rica, altitude 2,300 meters, by H. Pittier (no. 249).

RANGE: Mountains of central Costa Rica.

COSTA RICA: Las Lajas, above San Isidro, *Standley & Valerio* 51515, 51679.

92. Peperomia tsakiana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 178. 1897.

TYPE LOCALITY: Duruí Valley, Talamanca, Province of Limón, Costa Rica (*Pittier* 9383, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9540.

92a. Peperomia tsakiana victoriana C. DC., var. nov.

Peperomia tsakiana victoriana C. DC. Candollea **1**: 413. 1923, name only.

Leaves smaller (scarcely 3×10 cm.); petiole and scape densely villous; spikes shorter (in fruit only 20 mm. long).

Type in the DeCandolle Herbarium, collected at Victoria, on the Zent, Costa Rica, by H. Pittier (no. 16085).

RANGE: Caribbean slope of Costa Rica.

93. Peperomia compotrix Trel., sp. nov.

A rhizomatous assurgent epiphytic herb; stem moderately stout (3 to 4 mm.), glabrescent; leaves alternate, oblanceolate to elliptic-obovate, bluntish, acute-based, rather large (4×8 to 12 or 7×14 cm.), dull, granular, paler beneath and sparingly hairy on the midrib, pinnately veined nearly throughout, the curved branches of the midrib about 6×2; petiole subglabrescent, 3 to 5 cm. long; spikes clustered at the upper nodes of a somewhat villous forking several-bracted panicle scant 15 cm. long, small (2×20 mm.), blunt; peduncles short (5 mm.), glabrate; bracts round-peltate; berries narrowly oblong, dark, slender-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,229,300, collected at Guápiles, Province of Limón, Costa Rica, altitude 300 to 500 meters, March 12, 13, 1924, by Paul C. Standley (no. 37542).

RANGE: Caribbean slope, Costa Rica.

COSTA RICA: Chitarría, Cartago, *Lankester*, February, 1926.

94. Peperomia platyphylla C. DC. Candollea **1**: 368. 1923; **2**: 188. 1925.

TYPE LOCALITY: Juan Viñas, Province of Cartago, Costa Rica (*Cook & Doyle* 269, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: La Hondura, *Standley* 37898.

95. Peperomia scutellata C. DC. Bull. Soc. Bot. Belg. **30**[1]: 230. 1891.

TYPE LOCALITY: División, Costa Rica (*Pittier* 3611, the type).

RANGE: Upper Reventazón Valley, Costa Rica.

96. Peperomia donnell-smithii C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 179. 1897.

TYPE LOCALITY: La Concepción, Llanos de Santa Clara, Province of Limón, Costa Rica (*J. D. Smith* 6742, the type).

RANGE: Caribbean lowlands of Costa Rica.

97. Peperomia calvicaulis C. DC. Bull. Soc. Bot. Belg. **36**[1]: 231. 1891.

TYPE LOCALITY: Carrillo Road near La Laguna, Costa Rica (*Biolley* "*Pittier*" 3177, the type).

RANGE: Across central Costa Rica.

COSTA RICA: At type locality, *Pittier* 3176. Guápiles, *Standley* 37467. Finca Montecristo, *Standley & Valerio* 49021. El Arenal, Guanacaste, *Standley & Valerio* 45312, 45317. El Silencio, near Tilarán, Guanacaste, *Standley & Valerio* 44776, 44808, 44831. Pejivalle, *Standley & Valerio* 47242, 47271. Orosi, *Standley* 39962. El Muñeco, Río Navarro, *Standley* 33462.

97a. Peperomia calvicaulis perexigua Trel., var. nov.

More hairy than the type.

Type in the U. S. National Herbarium, no. 796,550, collected at Tsaki, Talamanca, Province of Limón, Costa Rica, altitude 200 meters, April, 1895, by A. Tonduz (no. 9543).

RANGE: Caribbean slope of Costa Rica.

97b. Peperomia calvicaulis subpenninervis C. DC., var. nov.

Peperomia calvicaulis subpenninervis C. DC. Candollea **1**: 381. 1923, name only.

Leaves cordulate at the very base, 5 nerved, the upper branches of the midrib one-third above the leaf-base.

Type in the DeCandolle Herbarium, collected at Las Vueltas, Costa Rica, by H. Pittier (no. 12738).

RANGE: Caribbean slope of Costa Rica.

97c. Peperomia calvicaulis hydnostachya Trel., var. nov.

A moderate-sized glabrous repent herb; stem slender (2 mm.), rooting from the nodes; leaves alternate, elliptic-ovate, gradually and sharply very long-acuminate, rounded at base, rather large, 3×5 to (characteristically) 4 to 4.5×8 to 10 cm., 5 or 7 nerved nearly from the base; petiole 2 to 4 or 6 cm. long; spikes terminal, paired on rather slender stalks (1 to 2 cm. long) or in lateral pairs without such stalks, rather small (scarcely 2×30 mm.), closely flowered; peduncle about 1 cm. long; bracts round-peltate; berries narrowly oblong, persistently divergent on the rachis, flexuously long-beaked; stigma anterior at base of the slender beak.

Type in the U. S. National Herbarium, no. 577,461, collected at Tuis, Province of Cartago, Costa Rica, altitude 650 meters, November, 1897, by A. Tonduz (no. 11530).

RANGE: Caribbean slope of Costa Rica.

97d. Peperomia calvicaulis ovata Trel., var. nov.

Leaves becoming broadly ovate and as much as 4.5×6 to 7 cm.

Type in the U. S. National Herbarium, no. 1,251,212, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January 18, 1926, by Paul C. Standley and Juvenal Valerio (no. 45168).

RANGE: Across central Costa Rica.

COSTA RICA: Cerro de las Lajas, above San Isidro, *Standley & Valerio* 51678. El Muñeco, Río Navarro, *Standley* 33640.

98. Peperomia cacuminicola Trel., sp. nov.

A rather large, erect, simple, glabrous herb, similar in aspect to *P. dotana;* stem rather stout (5 to 6 mm. at base), (normally ?) membranous-winged below; leaves alternate, elliptic, acute or subacuminately pointed at both ends, rather large (5.5×13 cm.), pinnately few-veined from below the middle, drying thin and glossy, the lighter green lower surface with concolorous granules; petiole 1.5 to 2 cm. long, winged; spikes solitary, terminal, moderately stout and elongate (3×70 mm.), densely flowered; peduncle moderately slender, 20 mm. long; bracts round-peltate, red-glandular.

Type in the U. S. National Herbarium, no. 1,251,143, collected near Finca La Cima, north of El Copey, Province of San José, Costa Rica, altitude 2,100 to 2,400 meters, December 21, 22, 1925, by Paul C. Standley (no. 42637).

RANGE: Central mountains of Costa Rica.

99. Peperomia dotana Trel., sp. nov.

A rather large, rhizomatous, erect, subsimple, glabrous herb; stem stout (3 to 6 mm.); leaves alternate, subrhombic-lanceolate, pointed at both ends, rather large (6 to 7×13 cm.), thick, revolute, pinnately veined below, the delicate branches of the midrib about 5×2; petiole rather elongate (2.5 cm.); spikes about 4, scattered or bunched on slender axillary branches 5 or 6 cm. long, moderately slender and short (30 to 40 mm.); peduncles about 5 mm. long; bracts round-peltate; berries gray, ellipsoid, stout-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,251,135, collected at Laguna de la Chonta, near Santa María de Dota, Province of San José, Costa Rica, altitude 2,000 to 2,100 meters, December 18, 1925, by Paul C. Standley (no. 42280).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Finca La Cima, above El Copey, *Standley* 42770. Cerro de las Vueltas, *Standley & Valerio* 43509.

100. Peperomia isidroana Trel., sp. nov.

A rather large, arboricolous, rhizomatous, erect, glabrous herb; stem rather stout (3 to 4 mm.); leaves alternate, elliptic or lance-elliptic, pointed at both ends, rather large (4.5 to 6×11 to 16 cm.), pinnately veined below, the branches of the midrib about 5×2; petiole rather short (1 to 2.5 or 3 cm.); spikes 2 to 5, scattered or clustered on slender axillary stalks 4 to 10 cm. long, elongate (2×6 to 10 mm.); peduncles scarcely 10 mm. long; bracts round-peltate; berries brown, ellipsoid, with rather slender beak; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,251,319, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February, 1926, by Paul C. Standley and Juvenal Valerio (no. 50232).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 50244.

101. Peperomia navarrana Trel., sp. nov.

A rather large, rhizomatous, erect, glabrous, arboricolous herb; stem rather slender (3 to 4 mm.), reddish; leaves alternate, elliptic-obovate, rather obtuse, cuneate, rather large (4.5×10 to 5.5×15 cm.), pinnately nerved below, the delicate branches of the midrib about 6×2; petiole short (1.5 cm.); spikes about 3, scattered on slender axillary stalks about 6 cm. long, rather short

(30 to 60 mm.); peduncles about 5 mm. long; bracts round-peltate; berries gray, ellipsoid, stout-beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,229,236, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33553).

RANGE: Upper Reventazón Valley, Costa Rica.

102. Peperomia durandi C. DC. Bull. Soc. Bot. Belg. 30[1]: 225. 1891.

TYPE LOCALITY: Volcán de Barba, Costa Rica (*Pittier* 2015, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Alajuelita, *Pittier* 2533. El General, *Pittier* 3402. La Palma, *Tonduz* 12541; *Standley* 33049. Cerro de las Lajas, above San Isidro, *Standley & Valerio* 51588. Yerba Buena, above San Isidro, *Standley & Valerio* 50153. Cerro de las Caricias, near San Isidro, *Standley & Valerio* 52399.

103. Peperomia tremendalensis Trel., sp. nov.

A rather small, succulent, glabrous herb; stem 1 to 4 mm. thick, with erect slender branches; leaves alternate, elliptic, subacute, mostly acute-based, 2.5 to 3×4 to 4×7 to 10 cm., drying coriaceous and dull green, inconspicuously pinnately veined; petiole 10 to 15 mm. long, winged; spikes subpaniculate on a slender stalk as much as 5 cm. long with deciduous bracts, rather slender and elongate (2×50 or 60 mm.); peduncle 10 to 20 mm. long; bracts round-peltate.

Type in the DeCandolle Herbarium, collected on Colinas de Tremendal, San Ramón, Province of Alajuela, Costa Rica, by A. Tonduz (no. 17788).

RANGE: Pacific slope of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 17785. Santiago, *Tonduz* 17787, 17789. Cerro de Zurquí, above San Isidro, *Standley & Valerio* 50833. Cerro de las Lajas, above San Isidro, *Standley & Valerio* 51565.

104. Peperomia pachyphlebia Trel., sp. nov.

A rather small, succulent, glabrous herb, growing on tree trunks; stem thick (7 mm.), rooting from the nodes, with erect thinner branches; leaves alternate, elliptic or elliptic-obovate, subacute or slightly acuminate, acute at base, moderate (scarcely 3×5.5 cm.), on the erect branches, drying dull rugulose and coriaceous, conspicuously pinnately veined nearly throughout when dry, the prominent branches of the midrib 4 to 6×2; petiole 1 to 1.5 cm. long, winged; spikes terminal, solitary, moderately slender and long (2×70 to 90 mm.); peduncle 4 to 5 cm. long with a bract-scar about 1 cm. below the spike; bracts round-peltate; ovary elongate, long-beaked; stigma anterior near the base of the beak.

Type in the U. S. National Herbarium, no. 798,276, collected at La Palma, Province of San José, Costa Rica, altitude 1,460 meters, September, 1898, by A. Tonduz (no. 12606).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Candelaria, *Hoffmann* 799.

105. Peperomia peninsularis Trel., sp. nov.

Peperomia obtusifolia Auct., p. p., as to Costa Rica.

A glabrous ascending herb, rooting at the lower nodes; stem moderately slender (2 to 3 mm.); leaves alternate, subelliptic, becoming acute or subacuminate, gradually acute at base, moderate (about 3×6 to 8 cm.), obscurely pinnately veined; petiole 1 to 3 cm. long; spikes terminal, solitary on a 1-bracted stalk 4 cm. long, slender, rather long (2 to 3×150 mm.); peduncle elongate (7 to 10 cm.); bracts round-peltate; berries broadly ellipsoid, rather slender-beaked; stigma anterior at base of the beak.

Type in the DeCandolle Herbarium, Geneva, collected at Nicoya, Costa Rica, by A. Tonduz (no. 13694).

RANGE: Nicoya Peninsula, northwestern Costa Rica.

106. Peperomia mentiens Trel., sp. nov.

A rather small, stoloniferous, glabrous herb; stem short and rather slender (3 to 4 mm.); leaves alternate, elliptic-spatulate, obtuse, more or less emarginate, cuneately attenuate, rather large (3 to 4.5×6 to 10 cm.), drying rather thin-coriaceous and dull, pinnately veined nearly throughout, the branches of the midrib about 8×2; petiole 3 to 6 cm. long, winged to about the middle; spikes terminal and axillary, moderately stout and long (3×75 to 110 mm.); peduncle long (9 to 12 cm.), characteristically with a deciduous reduced leaf 5 cm. below the spike; bracts small, round-peltate; berries fusiform-oblong, the short conical beak filiformly protracted; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 796,641, collected along Río Turrialba, Province of Cartago, Costa Rica, altitude 500 meters, March, 1894, by John Donnell Smith (no. 4926B).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Peralta, *Stork* 516. Pejivalle, *Standley & Valerio* 47260, 47275. Guápiles, *Standley* 37551. El Arenal, Guanacaste, *Valerio* 31. La Colombiana Farm, *Standley* 36974.

106a. Peperomia mentiens lata Trel., var. nov.

A broader-leaved extreme, with leaves becoming 5 to 6.5×11 to 15 cm.

Type in the U. S. National Herbarium, no. 1,251,285, collected at Finca Montecristo, on the Río Reventazón, Province of Limón, Costa Rica, altitude 25 meters, February 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 49012).

RANGE: Lower Reventazón Valley, Costa Rica.

107. Peperomia pyrolaefolia Trel., sp. nov.

A rather small, assurgent, essentially glabrous herb; stem moderately thick (4 to 5 mm.), rooting from the nodes below; leaves alternate, suborbicular, sometimes emarginate, abruptly acute at base, moderate (4×4 to 4.5 or 6×7 cm.), drying dull, somewhat puberulent above at base, pinnately veined below, the branches of the midrib about 4×2; petiole 2 cm. long, winged; spikes terminal, moderately thick and elongate (2×70 to 120 mm.); peduncle 5 cm. long, bracted at about the middle; bracts round-peltate; berries ellipsoid, with a rather long tapering beak; stigma anterior on the beak.

Type in the U. S. National Herbarium, no. 798,283, collected at Limón, Province of Limón, Costa Rica, July, 1898, by H. Pittier (no. 12691).

RANGE: Caribbean lowlands of Costa Rica.

108. Peperomia pseudo-alpina Trel., sp. nov.

Peperomia magnoliaefolia parrifolia Auct., as to Costa Rica.

An essentially glabrous repent-assurgent mountain herb; stem rather slender (2 mm.), rooting from the lower nodes; leaves alternate, elliptic or elliptic-obovate, slightly emarginate at the somewhat contracted apex, acute at base or subcuneate, rather small (1.5 to 3×3 to 4.5 cm., or over 4×6 cm.), drying dull and subcoriaceous, subpinnately nerved from below the middle, the branches of the midrib 2 or 3×2; petiole about 1 cm. long; spikes terminal, 1 to 3 on a slender bracted stalk scarcely 2 cm. long, small (scarcely 2×30 mm.), closely flowered; peduncle about 1 cm. long; bracts round-peltate; berries ovoid, obliquely beaked; stigma anterior at base of the beak.

Type in the U. S. National Herbarium, no. 1,080,165, collected on Colinas de Piedades, San Ramón, Province of Alajuela, Costa Rica, altitude 1,100 to 1,200 meters, April 27, 1901, by A. M. Brenes (no. 14180).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Quesera to Roble de Copey, *Tonduz* "12222," 12223. Volcán de Barba, *Pittier* 2203. La Estrella, Cartago, *Cooper* 542 (J. D. Smith 5926). Aserrí to Tarbaca, *Standley* 34090, 41375. Santa María de Dota, *Standley* 41626, 43058; *Standley & Valerio* 43493. Cerros de Zurquí, above San Isidro *Standley & Valerio* 50744, 50807. Fraijanes, *Standley & Torres* 47559, 47589, 47685. Without locality, *Stork* 462.

109. Peperomia pseudo-casaretti C. DC. Anal. Inst. Fis.-Geogr. Costa Rica. 9: 179. 1897.

Peperomia scandens Auct., as to Costa Rica.

TYPE LOCALITY: Shirores, Costa Rica (*Tonduz* 9282, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9538. Puerto Viejo, *Biolley* 7433. Santa Clara, Las Delicias, *Biolley* 10656. Guápiles, *Standley* 37434, 37445, 37454, 37508, 37550. Pejivalle, *Standley & Valerio* 42217, 47227, 47273. El Muñeco, Río Navarro, *Standley* 33608. Peralta, *Lankester* 882, and cultivated at Kew.

110. Peperomia calvifolia C. DC. Candollea 1: 290. 1923.

TYPE LOCALITY: Santiago, San Ramón, Province of Alajuela, Costa Rica (*Brenes* 14182, the type).

RANGE: Mountains of central Costa Rica.

COSTA RICA: La Palma, *Standley* 38231. Pejivalle, *Standley & Valerio* 47243. El Muñeco, Río Navarro, *Standley & Valerio* 51381. Viento Fresco, Volcán de Poás, *Standley & Valerio* 48007.

110a. Peperomia calvifolia abrupta Trel., forma nov.

Leaves reduced (scarcely 3×7 cm.) and elliptic-subobovate.

Type in the U. S. National Herbarium, no. 1,229,643, collected at El Muñeco, Río Navarro, Province of Cartago, Costa Rica, altitude 1,400 meters, February 8, 9, 1924, by Paul C. Standley (no. 33955).

RANGE: Upper Reventazón Valley, Costa Rica.

111. Peperomia jarisiana C. DC. Linnaea 37: 382. 1872. (Erroneously spelled *darisiana l. c.* 304.)

TYPE LOCALITY: Mount Jaris, Province of San José, Costa Rica (*Oersted*, the type).

RANGE: Central mountains of Costa Rica.

112. Peperomia martagonifolia C. DC. Ann. Cons. Jard. Genève 21: 262. 1920 (name only); Candollea 1: 313. 1923; 2: 188. 1925; Schroeder, Candollea 3: 128. 1926.

Peperomia penicillata magnifolia Auct., as to Costa Rica.

TYPE LOCALITY: Santa Rosa de Copey, Province of San José, Costa Rica (*Tonduz* 12243, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At the type locality, *Tonduz* 12236. Cabagra, *Tonduz* 6892. Aserrí to Tarbaca, *Standley* 41389. Santa María de Dota, *Standley & Valerio* 43291, 43368a, 44062, 44108.

The nomenclature of this endemic Costa Rican species is confused through application in 1920 of the name (without description, but with reference to an unpublished Central American manuscript) to an Ecuadorean specimen collected by Sodiro; but that manuscript leaves no question that the name was intended to be connected with the type designated above.

112a. Peperomia martagonifolia contempta Trel., var. nov.

Peperomia rupigaudens Auct., as to Costa Rica.

Peperomia penicillata magnifolia Auct., as to Costa Rica.

A moderately large, glabrous, assurgent herb; stem moderately slender (2 to 3 mm.); leaves alternate or on some branches 2 to 4 at a node, lanceolate, subacuminate, gradually very acute at base, moderate (2×4 to 2.5×6 to 7 cm.), drying rather coriaceous, more or less distinctly 3 or usually 5 nerved; petiole slender, 1 to 2.5 cm. long; spikes terminal or axillary, filiform, elongate (60 to 90 mm.), closely flowered; peduncle 1 cm. long; bracts round-peltate; flowers separated by anastomosing ridges when dried; berries round-ovoid; stigma apical.

Type in the U. S. National Herbarium, no. 798,260, collected at San José, Costa Rica, June, 1891, by H. Pittier (no. 4249).

COSTA RICA: Along the Río de las Vueltas, Tucurrique, *Pittier* 12897. El Muñeco, Río Navarro, *Standley* 33653. Cerro de la Carpintera, *Standley* 34295, 34324, 35522.

112b. Peperomia martagonifolia wercklei (C. DC.) Trel.

Peperomia wercklei C. DC. Candollea 1: 306. 1923.

TYPE LOCALITY: San Cristóbal de Candelaria, Costa Rica (*Pittier* or *Werckle* 3688).

RANGE: Mountains of central Costa Rica.

112c. Peperomia martagonifolia torresana Trel., var. nov.

Leaves lance-elliptic, sharply acuminate, acute at base, 2.5 to 4×7 to 9 cm.; spikes 2 to 3×100 mm.

Type in the U. S. National Herbarium, no. 1,251,256, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,600 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47684).

RANGE: Central mountains of Costa Rica.

113. Peperomia turialvensis C. DC. Linnaea 37: 380. 1872.

TYPE LOCALITY: Turrialba, Province of Cartago, Costa Rica (*Oersted* 1003, the type).

RANGE: Reventazón Valley, Costa Rica.

The name has been corrected recently to *turrialvensis*.

113a. Peperomia turialvensis brachystachya Trel., var. nov.

A glabrous, rather tall, loosely branched, erect, arboricolous herb; stem slender (1 to 3 mm.); leaves 2, 3, or exceptionally 4, at a node, elliptic or lance-elliptic, or the largest obovate-elliptic, obtuse to obscurely acuminate, acute at base, moderatey small (1.5×3, 2×4.5, or 2.5×5.5 cm.), 5 nerved, drying thin, ciliolate upward; petiole 5 to 10 mm. long; spikes from the upper axils, rather small (1×30 mm.), rather loosely flowered, with pseudo-pedicels; peduncle filiform, scarcely 1 cm. long; bracts round-peltate; berries globose, short-mucronate; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,103, collected at Finca Las Cóncavas, Province of Cartago, Costa Rica, altitude 1,200 to 1,300 meters, December 7, 8, 1925, by Paul C. Standley (no. 41544).

RANGE: Reventazón Valley, Costa Rica.

COSTA RICA: At type locality, *Standley* 41559.

114. Peperomia barbana C. DC. Bull. Soc. Bot. Belg. 29^2: 70. 1890; 30^1: 233. 1891.

TYPE LOCALITY: Las Esmeraldas, Volcán de Barba, Costa Rica (*Tonduz* 1331 in part, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Biolley* 7258.

115. Peperomia nemoralis C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 179. 1897.

TYPE LOCALITY: Shirores, Costa Rica (*Tonduz* 9268, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Tsaki, *Tonduz* 9539.

116. Peperomia guanacastana Trel., sp. nov.

A moderately large, tufted, glabrous, arboricolous herb; stem moderate (2 mm.), drying dull and pale; leaves commonly 2 at a node, broadly oblanceolate, acuminate, long-cuneate, moderately large (2 to 3×6 to 9 cm.), drying rather pale and coriaceous, 5 or obscurely 7 nerved, slightly revolute; petiole rather elongate (10 to 15 mm.); spikes terminal, rather slender and elongate (2×40 to 70 mm. or more), becoming reticulately ridged between the flowers, obtuse; peduncle long (4 to 5 cm.), and at first slender; bracts minute, round-peltate; ovary ovoid, rather pointed; stigma nearly apical.

Type in the U. S. National Herbarium, no. 1,251,211, collected at El Arenal, Province of Guanacaste, Costa Rica, altitude 485 to 600 meters, January 18, 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45065).

RANGE: Mountains of Guanacaste, Costa Rica.

COSTA RICA: At type locality, *Valerio* 85. El Silencio, near Tilarán, Guanacaste, *Standley & Valerio* 44838.

117. Peperomia barbinodis Trel., sp. nov.

Rather large but slender; stem hairy at the nodes; leaves 2 to 5 at a node, lanceolate, gradually tapered to both ends, prominently 3 nerved, 1 to 1.5×3 to 5 cm., somewhat ciliate; petiole scarcely 5 mm. long; spikes axillary and terminal, filiform, 30 to 50 mm. long, loosely flowered; peduncle 5 mm. long; bracts round-peltate; ovary ovoid, submucronate; stigma apical.

Type in the U. S. National Herbarium, no. 798,317, collected near Juan Viñas, Province of Cartago, Costa Rica, altitude 1,200 meters, December, 1896, by A. Tonduz (no. 10419).

RANGE: Reventazón Valley, Costa Rica.

The quite different *Peperomia oblongifolia* (no. 138, infra) is based on the same collection number.

118. Peperomia stipitifolia Trel., sp. nov.

A moderately tall, assurgent herb; stem moderate (2 to 4 mm.), appressed-soft-hairy, especially above; leaves opposite, or rather exceptionally 3 at a node upward, elliptic or lance-elliptic, subacute at both ends or obscurely acuminate, rather small (about 2×4 cm., reduced upward to 1×2 cm.), commonly 5 nerved, sparsely and softly appressed-hairy, paler beneath; petiole 2 cm. long, shortened upward, soft-hairy; spikes terminal and from the upper axils, 1.5×40 mm., rather closely flowered; peduncle 5 to 10 mm. long, pubescent; bracts round-peltate; ovaries immersed, ovoid; stigma subapical.

Type in the U. S. National Herbarium, no. 1,251,184, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 44013).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Finca La Cima, near El Copey, *Standley & Valerio*, 42802.

119. Peperomia palmana C. DC. Bull. Soc. Bot. Belg. **29**[1]: 71. 1890; **30**[1]: 233. 1891.

Peperomia palmana oppositifolia C. DC. Anal. Inst. Fis.-Geogr. Costa Rica **9**: 180. 1897.

TYPE LOCALITY: La Palma, Province of San José, Costa Rica (*Pittier* 724, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Vara Blanca, *Maxon & Harvey* 8333. Volcán de Barba, *Tonduz* 1331, 1332 in part, 2202 in part. Roble de Copey, *Tonduz* 12224. Santa Rosa de Copey, *Tonduz* 12221. El Tablazo, *Brade* 2002; *Tonduz* 7904, 7991 (type of *P. palmana oppositifolia*). Rancho Flores, *Tonduz* 2178. San Cristóbal de Candelaria, *Wercklé* 3689. Cartago, *Cooper* 471. La Estrella, Cartago, *Cooper* 5925; *Standley* 39258. Orosi, *Standley* 39778, 39896. Laguna de la Chonta, *Standley* 42162. Laguna de la Escuadra, *Standley* 41915, 41991, 42009. Finca La Cima, near El Copey, *Standley* 42638. Zurquí, *Standley & Valerio* 48324, 48347. Cerros de Zurquí, above San Isidro, *Standley & Valerio* 50861.

119a. Peperomia palmana fragrans C. DC. Bull. Soc. Bot. Belg. 30[1]: 233. 1891.

TYPE LOCALITY: Volcán de Turrialba, Costa Rica (*Lehmann* 1105, the type).

RANGE: Central mountains of Costa Rica.

119b. Peperomia palmana oxystachya (C. DC.) Trel.

Peperomia oxystachya C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 180. 1897.

TYPE LOCALITY: El Tablazo, Province of San José, Costa Rica (*Tonduz* 8041, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: La Ventolera, Volcán de Poás, *Standley* 34652, 34695. Fraijanes, *Standley & Torres* 47560, 47578, 47597, 47680.

119c. Peperomia palmana pseudo-oxystachya Trel., var. nov.

Essentially glabrous; stem dark red; leaves commonly 4 or 5 at a node, subrhombic-ovate or elliptic, very blunt-attenuate, acute-based, 8×13, 10×20, or 12×27 mm., 3 or obscurely 5 nerved, the yellowish lower surface granular; spikes numerous, 1×25 mm.; peduncle 10 mm. long.

Type in the U. S. National Herbarium, no. 1,251,497, collected at Yerba Buena, above San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February 22, 28, 1926, by Paul C. Standley and Juvenal Valerio (no. 49222).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 49115, 50225.

120. Peperomia copeyana C. DC. Candollea 1: 312. 1923.

TYPE LOCALITY: Santa Rosa de Copey, Province of San José, Costa Rica (*Pittier* or *Tonduz* 12228, the type).

RANGE: Central mountains of Costa Rica.

121. Peperomia emiliana C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 179. 1897.

TYPE LOCALITY: La Emilia, Llanos de Santa Clara, Province of Limón, Costa Rica (*J. D. Smith* 6740, the type).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: La Colombiana Farm, *Standley* 36889.

122. Peperomia olivacea C. DC. Journ. Bot. Brit. & For. 4: 146. 1866.

TYPE LOCALITY: San José, Costa Rica (*Hoffmann* 810, the type).

RANGE: Central mountains of Costa Rica.

122a. Peperomia olivacea perlongispica Trel., var. nov.

Erect, hairy; leaves 2 to 4 at a node, round-obovate below, elliptic or lance-elliptic upward, commonly emarginulate, acute-based, 10×10, 13×20, or 9×24 mm.; spikes 2×250 mm.; berries globose, obliquely mucronate, with pseudo-cupule; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,171, collected at Quebradillas, near Santa María de Dota, Province of San José, Costa Rica, altitude 1,800 meters, December 24, 1925, by Paul C. Standley (no. 43368).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Santa María de Dota, *Standley* 41646, 41658, 43367; *Standley & Valerio* 43492. Aserrí to Tarbaca, *Standley* 34103. La Ventolera, Volcán de Poás, *Standley* 34598. El Muñeco, Río Navarro, *Standley* 33433, 33520, 33838. Orosi, *Standley* 39645.

123. Peperomia esperanzana Trel., sp. nov.

A rather large divaricately branched, arboricolous herb; stem moderately stout (2 to 4 mm.), densely crisp-pubescent or subglabrescent; leaves opposite, orbicular, 1 to 1.5 cm. in diameter, rather obscurely 5 nerved, sometimes crisp-pubescent at base and on the nerves; petiole scarcely 3 mm. long, crisp-pubescent; spikes terminal and axillary, 2×40 to 60 mm., rather loosely flowered, with stout pseudo-pedicels; peduncle about 5 mm. long, glabrous; bracts round-peltate; berries round-mucronate; stigma oblique.

Type in the U. S. National Herbarium, no. 1,229,251, collected at La Esperanza, Volcán de Irazú, Costa Rica, February 23, 1924, by Paul C. Standley (no. 35357).

RANGE: Mountains of central Costa Rica.

124. Peperomia aguacalientis Trel., sp. nov.

Peperomia myrtillus Auct., as to Costa Rica.

Peperomia rhombea Auct., as to Costa Rica.

Cespitose, succulent, glabrous; leaves commonly 4 at a node, lanceolate or lance-elliptic, bluntly subattenuate, subobtuse at base, 7 to 10×18 to 30 mm., drying opaque, more or less evidently 3 or 5 nerved; petiole 1 to 2 mm. long; spikes axillary and terminal, 1×10 to 20 mm.; peduncle filiform, 10 mm. long; bracts round-peltate; ovary ovoid, subacute; stigma nearly apical.

Type in the U. S. National Herbarium, no. 796,660, collected at Aguacaliente, Province of Cartago, Costa Rica, May, 1890, by H. Pittier (no. 2555; J. D. Smith distribution no. 4928).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Gloria de Juan Viñas, *Pittier* 3657. Siquirres, *Pittier* 4248. Las Vueltas, ?*Tonduz* 13135. Dulce Nombre, near Cartago, *Standley* 35904.

125. Peperomia pseudo-boliviensis Trel., sp. nov.

Peperomia boliviensis Auct., as to Costa Rica.

A succulent glabrate repent herb; leaves commonly 3 at a node, subrhombic-elliptic or obovate, 1.5×2 to 2.5 cm., 3 or 5 nerved, very thick and impressed-punctulate; petiole scarcely 5 mm. long; spikes terminal, 1×40 to 80 mm.; peduncle 25 mm. long; bracts round-peltate; rachis glabrous; ovary ovoid; stigma apical.

Type in the herbarium of the Jardin Botanique de l'État, Brussels, collected at Turrialba, Province of Cartago, Costa Rica, by A. Tonduz (no. 8436).

RANGE: Reventazón Valley, Costa Rica.

Also cultivated at Berlin from seed received from Wercklé.

126. Peperomia cartagoana Trel.

Peperomia reflexa pallida C. DC. Bull. Soc. Bot. Belg. 30[1]: 235. 1891.

TYPE LOCALITY: San José, Costa Rica (*Pittier* 3198, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Candelaria, *Oersted* 991. Mount Aguacate, *Oersted* 992. San Marcos, *Pittier* 7766. Aguacaliente, *Pittier* 2554. El General, *Pittier* 3397. Curridabat, ?*Pittier* 3046. Cartago, ?*Carleton* 311; *Standley* 33324, 33334

Río Reventado, above Cartago, *Standley & Valerio* 49464, 49514, 49517, 49519, 49624, 49641. Dulce Nombre, near Cartago, *Standley* 35890. Guarco, *Torres* 75. Finca Las Cóncavas, *Standley* 41456, 41458a. San Isidro Coronado, *Alfaro* 32403. La Verbena, near San José, *Standley* 32231. Finca La Cima, near El Copey, *Standley* 42785.

127. Peperomia reflexaefolia Trel., sp. nov.

Peperomia reflexa angustifolia C. DC. Anal. Inst. Fis.-Geogr. Costa Rica 9: 180. 1897.

Peperomia berlandieri Auct., as to Costa Rica.

Type in the DeCandolle Herbarium, collected at La Esmeralda, Volcán de Barba, Costa Rica, by Biolley and Pittier (no. 7259); the type also of *Peperomia reflexa angustifolia* C. DC.

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Tonduz* 2201. Volcán de Poás, *J. D. Smith* 6746; *Standley* 34582. Cartago, *Cooper* 480 (J. D. Smith 5928b). La Estrella, *Cooper* 187, 421 (J. D. Smith 5923). Las Cóncavas, *Standley* 38989. Cerro de la Carpintera, *Standley* 34267. Aguacaliente, *Pittier* 2531, 2552. Candelaria, *Hoffmann* 796. Santa Rosa de Copey, *Tonduz* 12221. Fraijanes, Province of Alajuela, *Standley & Torres* 47603. Cerro de las Lajas, Heredia, *Standley & Valerio* 51439. Aserrí to Tarbaca, *Standley* 34130. Río Blanco, El Copey, *Standley* 41908. Quebradillas, Santa María de Dota, *Standley* 43089, 43092. Santa María de Dota, *Standley* 41731, 41864. San José, *Pittier* 2848; *Standley* 33309, 41209. San Sebastián, *Standley* 32723, 49378, Camino de Hatillo, *Standley* 32175, 32177, 32178. Río Tiribí, *Alfaro* 33976b.

128. Peperomia compaginata Trel., sp. nov.

A small stoloniferous arboricolous mountain herb with dwarf compactly branched tufts scarcely 5 cm. tall; stem slender (1 to 2 mm.), glabrous; leaves commonly about 4 at a node, crowded, subrhombic-elliptic or obovate, obtuse, subacute at base, minute (4×7 to 5×9 mm.), revolute, more or less 3 nerved, impressed-punctulate beneath, glabrous; petiole 1 to 2 mm. long, obscurely puberulent; spikes terminal, as yet small (1×10 mm.), nearly straight; peduncle shorter than the leaves; bracts round-peltate, the rachis apparently glabrous.

Type in the U. S. National Herbarium, no. 1,251,253, collected at Fraijanes, Province of Alajuela, Costa Rica, altitude 1,500 to 1,700 meters, February 12, 13, 1926, by Paul C. Standley and Rubén Torres (no. 47624).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley & Torres* 47563.

129. Peperomia subemarginulata (C. DC.) Trel.

Peperomia reflexa subemarginulata C. DC. in DC. Prodr. 16¹: 452. 1869.

TYPE LOCALITY: Mount Candelaria, Costa Rica (*Hoffmann* 21, the type, at Berlin).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Santa Rosa de Copey, *Tonduz* 12227, 12246. San José, *Pittier* 2848. San Sebastián, *Standley* 32723, 49378. Juan Viñas, *Pittier* 378, 3304. Río Tilirí, *Tonduz*, 3209.

130. Peperomia pirrisana Trel., sp. nov.

Essentially glabrous, repent, arboricolous; stem drying deeply sulcate, 1 to 2 mm. in diameter; leaves opposite, round or round-elliptic, 1 to 2.5×1.5 to 3 cm., hard-papery, 3 nerved, revolute, convallate at base; petiole 1 to 2 mm. long, obscurely puberulent; inflorescence unknown.

Type in the U. S. National Herbarium, no. 1,318,153, collected at Pozo Azul de Pirrís, Costa Rica, August, 1927, by C. H. Lankester (no. 1166).

RANGE: Upper Reventazón Valley, Costa Rica.

131. Peperomia cyclophylla Miq. in Mart. Fl. Bras. 4: 219. 1852, name only: Seemann, Bot. Voy. Herald 198. 1856.

Peperomia circinata Auct., as to Costa Rica.

TYPE LOCALITY: Panama (*Seemann* 607, the type).

RANGE: Panama and the Pacific slope of Costa Rica. Represented by closely comparable forms in Salvador and Guatemala, the West Indies, and from Peru to Brazil in South America.

COSTA RICA: La Barranca, *Oersted* 930. Boruca, *Tonduz* 6859. Capulín, *Standley* 40200.

The nomenclature of this species is comparable with that of *Peperomia martagonifolia* C. DC. When first actually published, without description, the name was used for a Brazilian collection supposed to be conspecific with that from Panama on which the earlier written but then unpublished description was based.

132. Peperomia imbricata Trel., sp. nov.

A small, creeping-assurgent, glabrous, succulent herb; stem slender (1 mm.), with short internodes, very leafy; leaves 3 or 4 at a node, ascending-imbricate, obovate, commonly obtuse or recurved-emarginulate, rather blunt at base, minute (about 4×6 mm.), nerveless, concave in drying; petiole 1 to 2 mm. long; spikes terminal, small (1.5×10 mm.), curved, closely flowered; peduncle rather slender, somewhat shorter than the spike, drying red-brown; bracts round-peltate, transversely grooved.

Type in the U. S. National Herbarium, no. 796,733, collected at El Infiernillo, Juan Viñas, Province of Cartago, Costa Rica, November, 1890, by H. Pittier (no. 3178).

RANGE: Reventazón Valley, Costa Rica.

133. Peperomia pseudo-tetraphylla Trel., sp. nov.

A small glabrous succulent arboricolous herb, stoloniferous-tufted; stem slender (1 mm.), rooting below; leaves commonly 4 at a node, rather oblong-obovate, acute-based, emarginulate, minute (4×6 to 5×12 mm.), more or less evidently 1 nerved; petiole very short (1 to 2 mm.); spikes terminal, nearly straight, scarcely 2×20 to 30 mm., obtuse, closely flowered; peduncle filiform, about half as long as the spike (10 to 15 mm.); bracts round-peltate; berries sessile, ovoid, with pseudo-cupule and a slender style; stigma apical.

Type in the U. S. National Herbarium, no. 1,251,099, collected at Finca Las Cóncavas, Province of Cartago, Costa Rica, altitude 1,200 to 1,300 meters, December 7, 8, 1925, by Paul C. Standley (no. 41488).

RANGE: Mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley* 41458. About Cartago, *Stork* 323, 397. La Estrella, Cartago, *Standley* 39559. El Muñeco, Río Navarro, *Standley* 33464, 33518, 33654; *Standley & Torres* 51691. Santa María de Dota, *Standley* 42122, 42397; *Standley & Valerio* 43189, 43358. Laguna de la Chonta, near Santa María de Dota, *Standley* 42191, 42258. Laguna de la Escuadra, near El Copey, *Standley* 42037. Finca La Cima, near El Copey, *Standley* 42607, 42679, 42708.

133a. Peperomia pseudo-tetraphylla juvenalis Trel., var. nov.

Small, glabrous, stoloniferous-tufted; leaves 2 to 5 at a node, obovate, emarginulate, 5 to 6×8 to 10 mm., glandular-granular beneath; spikes 2×25 mm.; peduncle filiform; ovary ovoid.

Type in the U. S. National Herbarium, 1,251,181, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 44003).

RANGE: Central mountains of Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 43694.

134. Peperomia sepicola Trel., sp. nov.

Erect, branching, arboricolous, glabrous except for the puberulent stem (? and rachis); leaves about 5 at a node, crowded, obovate, sometimes emarginulate, rather acute at base, drying waxen, thick, and nerveless or 1 nerved, coarsely golden-granular beneath; petiole almost suppressed; inflorescence unknown.

Type in the DeCandolle Herbarium, Geneva, collected at San Ramón, Province of Alajuela, Costa Rica, by A. Tonduz (no. 17790).

RANGE: Pacific slope of Costa Rica.

135. Peperomia hoffmannii C. DC. Journ. Bot. Brit. & For. 4: 133. 1866.

TYPE LOCALITY: San José, Costa Rica (*Hoffmann* 415, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: San José, *Polakowsky* 391; *Cook & Doyle* 1, 168. Zapote, near San José, *Standley* 40250. San Pedro Montes de Oca to Curridabat, *Standley* 32775. La Palma, *Standley* 38233. Río Tiribí, near San José, *Alfaro* 33976 (a), 33991. Volcán de Irazú, *Oersted* 958; *Lehmann* 1111. Río Naranjo, *Tonduz* 7227. San Juan, *Tonduz* 1416.

136. Peperomia pseudo-hoffmannii Trel., sp. nov.

A small repent arboricolous herb of the aspect of *P. hoffmannii* and *P. reflexaefolia* but the ciliate-ridged spikes 15 to 20 mm. long.

Type in the U. S. National Herbarium, no. 1,251,189, collected at Tilarán, Province of Guanacaste, Costa Rica, altitude 500 to 650 meters, January 10–31, 1926, by Paul C. Standley and Juvenal Valerio (no. 44198).

RANGE: Pacific slope of northwestern Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 44216, 44395. Los Ayotes, Guanacaste, *Standley & Valerio* 45608.

136a. Peperomia pseudo-hoffmannii lenticularis Trel., var. nov.

Lenticularly fleshy leaves scarcely punctulate; curved spikes 20 to 30 mm. long, on peduncles 10 to 15 mm. long.

Type in the U. S. National Herbarium, no. 1,229,265, collected at La Colombiana Farm, Province of Limón, Costa Rica, altitude 70 meters, March 6, 7, 1924, by Paul C. Standley (no. 36837).

RANGE: Caribbean lowlands of Costa Rica.

COSTA RICA: At type locality, *Standley* 36830.

137. Peperomia amphoterophylla Trel., sp. nov.

Peperomia galioides longifolia Auct., as to Costa Rica.

A small branching assurgent herb; stem slender (1 to 2 mm.), for a time puberulent; leaves opposite or mostly 3 or 4 at a node, rather small, at base and on sterile shoots round or obovate and scarcely 3×4 mm., elsewhere oblong and elongate (4×20 to 30 mm.), rounded or emarginulate at apex, subacute at base, drying thin and flat, glabrous or subciliolate above, 3 or 5 nerved with the midrib branching at the middle, the shorter form granular-punctulate beneath; petiole very short (1 to 2 mm.), glabrous; spikes terminal and axillary, filiform and elongate (40 to 70 mm. long), loosely flowered; peduncle about 5 mm. long, glabrous; bracts round-peltate; berries sunken in pits in the rachis, dark, ovoid, scutulately pointed; stigma anterior.

Type in the U. S. National Herbarium, no. 796,599, collected at La Palma, Province of San José, Costa Rica, July, 1888, by P. Biolley (no. 939).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Volcán de Barba, *Tonduz* 939b. About San José, ? *Oersted* 944; *Hoffmann* 187; *Pittier* 8430; *Standley* 41208. Alajuela, *Alfaro* 499 (J. D. Smith 5924). Río Torres, *Tonduz* 9772. Uruca, *Tonduz* 7255. Santa María de Dota, *Standley* 41609, 42823. Río Reventado, above Cartago, ? *Standley & Valerio* 49465. El Carmen, *Torres* 122.

137a. Peperomia amphoterophylla glutineofructa Trel., var. nov.

A small, branching, assurgent or erect, arboricolous herb; stem rather slender (1 to 3 mm.), red, puberulent upward; leaves commonly 3 or 4 at a node, spatulate-oblong and about 3×15 mm., the lowermost sometimes broader and some 5×10 mm., emarginulate, subacute at base, thick, drying rather coriaceous, yellow and glandular-punctulate beneath, obscurely ciliolate upward, pinnately veined by transmitted light; petiole very short (1 to 2 mm.), more or less puberulent; spikes terminal, and sparingly from the uppermost axils, about 1×40 mm., rather loosely flowered; peduncle about 5 mm. long, glabrous; bracts round-peltate; ovary immersed; berries globose, scutulately pointed, red, very viscid-glandular; stigma oblique.

Type in the U. S. National Herbarium, no. 1,251,182, collected on Cerro de las Vueltas, Province of San José, Costa Rica, altitude 2,700 to 3,000 meters, December, 1925, by Paul C. Standley and Juvenal Valerio (no. 44007).

RANGE: High mountains of central Costa Rica.

COSTA RICA: At type locality, *Standley & Valerio* 43527, 44014. Finca La Cima, near El Copey, *Standley* 42609, 42817. Cerro de Piedra Blanca, near Escasú, *Standley* 32507. Laguna de la Chonta, near Santa María de Dota, *Standley* 42166, 42234. Quebradillas, near Santa María de Dota, *Standley* 43059, 43090.

138. Peperomia oblongifolia C. DC. Candollea 1: 299. 1923; 3: 129. 1926.

TYPE LOCALITY: Quebrada Honda, Juan Viñas, Province of Cartago, Costa Rica (*Pittier* 10419, the type).

RANGE: Caribbean slope of Costa Rica.

COSTA RICA: Alto de Ochomogo, *Pittier* 10385.

139. Peperomia muscisedens C. DC. Candollea 1: 398. 1923.

Peperomia muscicola C. DC. Candollea 1: 298. 1923. Not *P. muscicola* Ridl.

TYPE LOCALITY: Las Vueltas, Province of Cartago, Costa Rica (*Tonduz* 13135, the type).

RANGE: Caribbean slope of Costa Rica.

140. Peperomia pittieri C. DC. Bull. Soc. Bot. Belg. 30[1]: 235. 1891.

TYPE LOCALITY: La Palma, Province of San José, Costa Rica (*Pittier* 722, the type).

RANGE: Central mountains of Costa Rica.

COSTA RICA: Cerro de las Caricias, *Pittier* 14043. La Hondura, *Standley* 36216. Zurquí, *Standley & Valerio* 48189. El Muñeco, Río Navarro, *Standley* 33412, 33487, 33964; *Standley & Torres* 51734. Viento Fresco, *Standley & Torres* 47762. Above San Isidro, *Standley & Valerio* 50206 in part, 50213, 50817, 51503, 52146.

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CONTRIBUTIONS

FROM THE

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VOLUME 26, PART 5

NOTES ON CERTAIN TYPE SPECIMENS OF AMERICAN ASTERACEAE IN EUROPEAN HERBARIA

By S. F. BLAKE

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11

PREFACE

This number of the Contributions, by Dr. S. F. Blake, of the United States Department of Agriculture, presents some of the results of his examination of type specimens of Mexican and Central and South American Asteraceae preserved in several of the larger European herbaria. This study of historical material, much of which had never been critically examined since the species concerned were described half a century or even a century ago, although confirming our present understanding of a large number of species, has resulted in changes in the interpretation of four generic and over a hundred specific names. It serves to emphasize the need for careful reexamination, in the light of modern knowledge, of the very numerous type specimens of American plants preserved in European collections and known to students in America only by the often very meager original descriptions. Such specimens, on the correct identification of which the stability of our nomenclature depends, are frequently so fragmentary and imperfect that a photograph is not sufficient for recognition, and personal examination by a botanist thoroughly familiar with the group under investigation is required.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

NOTES ON CERTAIN TYPE SPECIMENS OF AMERICAN ASTERACEAE IN EUROPEAN HERBARIA

By S. F. Blake

In the course of the writer's work at several of the larger European herbaria in the summer of 1925, special effort was made to determine the identity of various American species of Asteraceae which were imperfectly described by early authors and have since been unrecognized or misinterpreted. In this paper four generic names (*Parastrephia, Philactis, Anaitis,* and *Aschenbornia*) and about 115 specific names which have been misunderstood or regarded as doubtful since the time of their original publication are first given their rightful status as valid names or synonyms. A few identifications here included have already been published.[1] The genera are arranged in the systematic order of the accepted names, the species alphabetically under the genera.

Special attention was given to the investigation of the Heliantheae, particularly in the Prodromus Herbarium of the DeCandolles, now forming a unit in the Delessert Herbarium, Geneva, and in the Schultz Bipontinus Herbarium, which includes Sprengel's types and forms a part of the Cosson Herbarium at the Muséum d'Histoire Naturelle at Paris. Schultz's herbarium includes, besides his own types and those of Sprengel, a wealth of fragments of types and authentic specimens from other authors, and the Prodromus Herbarium is rich in authentic specimens of earlier writers in addition to De Candolle's own types. A rather hurried examination was made of all the Asteraceae of the Humboldt and Bonpland Herbarium at Paris. Notes, photographs, and in many cases small fragments of types or significant specimens were obtained of hundreds of species of American Asteraceae, of which those discussed in this paper represent only the comparatively small part in which some change of interpretation has been found necessary. All photographs and fragments obtained are deposited in the United States National Herbarium.

[1] In the writer's treatment of Asteraceae in "Trees and shrubs of Mexico," by Paul C. Standley, Contr. U. S. Nat. Herb. **23**: 1401–1641, 1681. 1926, in a short paper in Proc. Biol. Soc. Washington **39**: 144. 1926, and elsewhere. Identifications of the Asteraceae described by Bertoloni in his "Florula Guatimalensis" have been given in a separate paper, "Bertoloni's Guatemalan Asteraceae," Bull. Torrey Club **53**: 215–218. 1926, and are not repeated here.

For assistance in the course of his work abroad, including the opportunity to take photographs and in many cases to obtain small fragments of types or authentic specimens, the writer wishes to express his thanks to the following botanists: Prof. H. Lecomte, Mr. F. Gagnepain, Mr. P. Danguy, and Mr. Réné Metman of the Muséum d'Histoire Naturelle, Paris; Dr. John Briquet of the Herbier Delessert, Geneva; Dr. G. Beauverd of the Herbier Boissier, now at the Université de Genève; Dr. A. W. Hill and Mr. J. Hutchinson of the Royal Botanic Gardens, Kew; Dr. A. B. Rendle of the British Museum of Natural History; and the late Dr. B. Daydon Jackson of the Linnaean Society of London.

Amaranthus spinosus L. Sp. Pl. 991. 1753.

Xanthium parvifolium DC. Prodr. **5**: 524. 1836.

DeCandolle's description of a specimen of *Amaranthus spinosus* as a new species of *Xanthium* must surely be the most remarkable aberration of that gifted and industrious botanist. The specimen in the Prodromus Herbarium, a mere scrap about 4 inches long, densely crowded with young flowers and bearing abundant spines and reduced rameal leaves, is marked on the original label "Xanthium. B. Delessert 1810." It agrees entirely with DeCandolle's description, and is unquestionably the specimen he had before him when writing it. The most likely explanation of his action seems to be that, having kept the unfortunate scrap next to *Xanthium spinosum* in his herbarium for a quarter of a century without closely examining it, and misled by its spines and general appearance—the clustered young flowers being not so very different superficially from the clusters of staminate heads of *Xanthium spinosum*—he proceeded to describe it as new for the Prodromus without more than a casual examination.

Vernonia deppeana Less. Linnaea **6**: 398. 1831.

Conyza tomentosis (*tomentosa* in errata) Mill. Gard. Dict. ed. 8. *Conyza* no. 5. 1768. Not *Vernonia tomentosa* Ell. 1821.

Miller's type of *Conyza tomentosa* is preserved in the British Museum and is a characteristic example of *Vernonia deppeana*. The identification of this and Miller's other new species of "*Conyza*" has already been the subject of an interesting article by James Britten,[2] but as his paper has apparently been overlooked by American botanists, it is well to call attention again to the identity of certain of Miller's species. Gleason[3] has recently taken up for *V. deppeana* the earlier name *V. stellaris* Llave.[4] Llave's description, although probably referring to *V. deppeana*, might also apply to *V. aschenborniana* Schauer, which occurs in the same region, and it seems inadvisable to adopt his name in the absence of a type specimen.

Vernonia stellata (Spreng.) Blake, Contr. U. S. Nat. Herb. **22**: 587. 1924.

Conyza stellata Spreng. Neu. Entd. **2**: 142. 1821.

Vernonia oppositifolia Less. Linnaea **4**: 273. 1829.

Sprengel's type, collected by "Otto" (i. e., Sellow) in Brazil, is no. 1009 in the Sprengel Herbarium, now incorporated in the Cosson Herbarium, and is the plant usually known as *Vernonia oppositifolia*.

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[2] Journ. Bot. Brit. & For. **36**: 51–55. 1898.

[3] N. Amer. Fl. **33**: 78. 1922.

[4] In Llave & Lex. Nov. Veg. Descr. **1**: 23. 1824.

Vernonia tarchonanthifolia (DC.) Schultz Bip. Linnaea **20**: 507. 1847.

Monosis tarchonanthifolia DC. Prodr. **5**: 77. 1836.

Vernonia purpurascens Schultz Bip. in Walp. Repert. Bot. **2**: 945. 1843.

Oliganthes karwinskii Schultz Bip. Linnaea **20**: 505. 1847.

Eremosis tarchonanthifolia Gleason, Bull. N. Y. Bot. Gard. **4**: 230. 1906.

Eremosis purpurascens Gleason, Bull. N. Y. Bot. Gard. **4**: 233. 1906.

Vernonia tarchonanthifolia (DC.) Schultz Bip., originally based on a specimen collected by Karwinski in Mexico without definite locality, is represented in the United States National Herbarium by three sheets from Oaxaca (*Pringle* 6166, *Conzatti & González* 554, and *C. L. Smith* 314). All were originally identified as *V. monosis* Schultz Bip., but are referred by Dr. Gleason to *V. tarchonanthifolia*, and well agree with DeCandolle's comparatively ample description of that species. In all the heads are 2-flowered, although described by DeCandolle as 1-flowered; the species evidently varies in this respect. *Vernonia purpurascens* Schultz Bip. is now referred by Gleason[5] to the synonymy of *Eremosis tomentosa* (Lex.) Gleason (=*Vernonia monosis* Schultz Bip.), but examination of the type in Schultz's herbarium, collected by Karwinski at San Pedro Nolasco, Oaxaca, shows definitely that it is a synonym of *V. tarchonanthifolia*. The heads were described by Schultz as 3-flowered, and the achenes as hirtous. Heads examined by the writer were 2-flowered, and the achenes rather densely glandular and sparsely pilose, as in *V. tarchonanthifolia*. *Oliganthes karwinskii* Schultz Bip., based on material collected by Karwinski at Capalalpan, Mexico, is, from description, correctly referred by Gleason to *V. tarchonanthifolia*.

Vernonia tortuosa (L.) Blake, Proc. Biol. Soc. Washington **39**: 144. 1926.

Conyza tortuosa L. Sp. Pl. 862. 1753.

Conyza scandens Mill. Gard. Dict. ed. 8. *Conyza* no. 11. 1768. Not *Vernonia scandens* DC. 1836.

Vernonia schiedeana Less. Linnaea **6**: 399. 1831.

The status of these names has already been discussed by the writer,[6] as well as by Britten.[7] Although Linnaeus mentioned a now unidentifiable Madagascan plant both in the Species Plantarum and in his earlier and fuller treatment in the Hortus Cliffortianus,[8] his description was based on a specimen of *Vernonia schiedeana* collected at Veracruz by Houstoun, sent to Linnaeus by Philip Miller, and now preserved in the "Hortus Cliffortianus" at the British Museum. Miller's type of *Conyza scandens*, also in the British Museum, is a specimen of the same species also collected by Houstoun or grown from seed sent by him.

Vernonia sp.

Viguiera angustifolia Glaz. Mém. Soc. Bot. France **3**: 412. 1910, nomen nudum.

Glaziou 21603, from "Corrego do Brejo, au campement, Goyaz," in the Paris Herbarium, type collection of this undescribed species, is a *Vernonia* apparently closely related to if not identical with *Vernonia compactiflora* Mart., a species known to the writer only from description.

Elephantopus carolinianus Raeuschel, Nom. Bot. ed. 3. 256. 1797.

Elephantopus carolinianus Willd. Sp. Pl. **3**: 2390. 1803.

The third edition of Raeuschel's Nomenclator, which the writer had opportunity of examining in the Kew library in 1925, is in the main a mere list of generic

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[5] N. Amer. Fl. **33**: 100. 1922.

[6] Proc. Biol. Soc. Washington **39**: 144. 1926.

[7] Journ. Bot. Brit. & For. **36**: 52. 1898.

[8] Hort. Cliff. 405. 1737.

and specific names arranged by the Linnaean system, with the habitat and duration added. The only new species in the Syngenesia is *Elephantopus carolinianus*, which is described as follows: "1604. Elephantopvs carolinianus*) Carolina. ♃." * "E. foliis radicalibus caulinisque oblongis, basi angustatis, subpilosis, caule subsimplici piloso." This is the earliest description of the plant universally known as *E. carolinianus* Willd., and fortunately necessitates no change in its designation beyond that of the authority. Willdenow's description agrees with that of Raeuschel except for a single word: "E. foliis radicalibus caulinisque oblongis basi angustatis subpilosis, caule simplici piloso. W." Whether this remarkable identity in description is due to coincidence only seems questionable. Raeuschel's name appears to have been overlooked by all later authors, and is not listed in "Index Kewensis."

Adenostemma viscosum triangulare (DC.) Benth.; Baker in Mart. Fl. Bras. **6** [2]: 186. 1876.

Adenostemma triangulare DC. Prodr. **5**: 113. 1836.

Polymnia corcovadensis Glaz. Mém. Soc. Bot. France **3**: 409. 1910, nomen nudum.

Fragments of the type number of Glaziou's name (*Glaziou* 5918, from Corcovado, near Carioca brook, Rio Janeiro, Brazil) are in the United States National Herbarium, obtained from the Paris Museum.

Stevia salicifolia Cav. Icon. Pl. **4**: 32. *pl. 354.* 1797.

Stevia angustifolia H. B. K. Nov. Gen. & Sp. **4**: 149. 1820.

The type of *Stevia angustifolia* in the Humboldt and Bonpland Herbarium, labelled as from "Mexico," is *Stevia salicifolia*. The leaves are narrowly lanceolate, 7 to 8 cm. long, 7 to 9 mm. wide, entire, and loosely sordid-pilosulous on the costa beneath.

Selloa glutinosa Spreng. Nov. Prov. Hal. 36. 1819.

Molina viscosa Hort. Berol.; Spreng. Nov. Prov. Hal. 37. 1819, as synonym. Not *Molina viscosa* Ruiz & Pav. 1798.

Gymnosperma glutinosum Less. Syn. Gen. Comp. 194. 1832.

Gymnosperma corymbosum DC. Prodr. **5**: 312. 1836.

Gymnosperma multiflorum DC. Prodr. **5**: 312. 1836.

Gymnosperma scoparium DC. Prodr. **5**: 312. 1836.

Selloa corymbosa Kuntze, Rev. Gen. Pl. **1**: 362. 1891.

Selloa multiflora Kuntze, Rev. Gen. Pl. **1**: 362. 1891.

Selloa scoparia Kuntze, Rev. Gen. Pl. **1**: 362. 1891.

The generic name *Selloa* has been independently published for two different genera of Asteraceae. The earlier genus of this name, published by Sprengel[9] in 1819, was based on *Selloa glutinosa*, supposed to be from Brazil, to which Sprengel later added[10] *Selloa capensis* Spreng., based on *Denekia capensis* Thunb. The latter species is the monotype of *Denekia* Thunb. (1800),[11] an unpreoccupied name, and Sprengel's action in displacing it by *Selloa* was of course unjustified even by the easy nomenclatorial practices of his time. Whether Lessing's course in giving the new name *Gymnosperma* [12] to *Selloa* Spreng. was a similar act of piracy, or whether it was due to ignorance of the 1819 publication of *Selloa* and the belief that it was published in 1826 and so antedated by *Selloa* H. B. K., is now impossible to ascertain. At any rate, the name *Gymnosperma* was adopted by DeCandolle in 1836 and has been used by all subsequent authors except

[9] Nov. Prov. Hal. 36. 1819.

[10] Syst. Veg. **3**: 496. 1826.

[11] Prodr. Pl. Cap. (no. LVI of introd., also p.) 153. 1800 (brief generic diagnosis, with specific name but no specific description); Nov. Gen. Pl. 177. 1801.

[12] Syn. Gen. Comp. 194. 1832.

Kuntze [13] and the present writer,[14] who have restored *Selloa* Spreng. to the position to which it is entitled by the law of priority. In 1925 the writer was able to examine the type of *Selloa glutinosa* Spreng. in the Schultz Bipontinus Herbarium and the types of *Gymnosperma corymbosum*, *G. multiflorum*, and *G. scoparium* DC. in the Prodromus Herbarium and found them all to belong to a single species, for which the name *Selloa glutinosa* Spreng. must be used on the basis of priority. Sprengel's ascription of a Brazilian habitat to the plant was evidently based on an error originating in the garden at Berlin, whence he described the species.

The second *Selloa*, described from Mexico by Humboldt, Bonpland, and Kunth in 1820 and belonging to the Heliantheae, was likewise monotypic. In 1826 Sprengel published for it and for a second species (*F. linearis*), which he described from Monte Video, the new name *Feaea*. This second species, *Feaea linearis* Spreng.,[15] was referred by Baker[16] to the synonymy of *Spilanthes arnicoides* DC. var. *macropoda* (DC.) Baker. A. H. Moore, in his revision of *Spilanthes*, used[17] for the latter the name *S. decumbens* (J. E. Smith) A. H. Moore var. *macropoda* (DC.) A. H. Moore, and placed *Feaea linearis* among his doubtful species. Sprengel's type, which the writer examined and photographed in 1925, is a *Spilanthes* of the *S. decumbens* group and appears to be somewhat intermediate between *S. decumbens* var. *macropoda* (DC.) A. H. Moore and var. *leptophylla* (DC.) A. H. Moore of Moore's revision. Sprengel's diagnosis of *Feaea* is very clearly based on that of *Selloa* H. B. K. and his first species is *F. plantaginea* (*Selloa plantaginea* H. B. K.), so that there can be no question that this species is to be taken as the type of his genus. Unfortunately the name is preoccupied by the earlier *Feea* Bory,[18] now considered a synonym of *Trichomanes* but regarded as valid by earlier authors (Gaudichaud in 1826, Presl in 1843, Brongniart in 1849). Both genera were named for the same botanist, A. L. A. Fée, and the difference in spelling is so slight that the names must be regarded as homonyms. Sprengel's name has, in fact, been "corrected" by Kuntze to *Féea*. Inasmuch as no other generic name has been proposed for *Selloa* H. B. K., a new one must be provided. The synonymy of this genus and species will then be as follows:

Feaella Blake, nom. nov.

Selloa H. B. K. Nov. Gen. & Sp. **4**: 265. 1820. Not *Selloa* Spreng. 1819.
Feaea Spreng. Syst. Veg. **3**: 362, 581. 1826. Not *Feea* Bory, 1824.
Feea Kuntze, Rev. Gen. Pl. **1**: 338. 1891.

Feaella plantaginea (H. B. K.) Blake.

Selloa plantaginea H. B. K. Nov. Gen. & Sp. **4**: 266. *pl. 395.* 1820.
Feaea plantaginea Spreng. Syst. Veg. **3**: 581. 1826.
Feea plantaginea Kuntze, Rev. Gen. Pl. **1**: 338. 1891.
Sabazia subnuda Robins. & Seat. Proc. Amer. Acad. **28**: 108. 1893.

Gutierrezia neaeana (DC.) Schultz Bip.

Brachyris neaeana DC. Prodr. **5**: 313. 1836.

This species, described by DeCandolle from material collected by Née without definite locality but "verisim. ex Mexico aut ex Chili," has apparently not been collected again. At any rate, the writer has been unable to match the plant, on the basis of an examination of the type, with any species known from the

[13] Rev. Gen. Pl. **1**: 361. 1891.

[14] In Standley, "Trees and shrubs of Mexico," Contr. U. S. Nat. Herb. **23**: 1484. 1926.

[15] Syst. Veg. **3**: 581. 1826.

[16] In Mart. Fl. Bras. **6**[3]: 234. 1884.

[17] Proc. Amer. Acad. **42**: 550. 1907.

[18] Dict. Class. Hist. Nat. **6**: 446. 1824. (Genus and two species described.)

west coast of South America; it is not one of the Mexican species. The following description will facilitate its recognition: Suffruticulose, about 4-stemmed, 6 cm. high, glabrous and glutinous; leaves linear-oblanceolate, obtuse or acutish, the lower up to 22 mm. long, 2 mm. wide; heads 1 to 4, on pedicels up to 1.3 cm. long; involucre subcampanulate, 6 mm. high, 5 mm. thick, few-seriate, the phyllaries few, appressed, triangular to oblong, acuminate to an obtusish apex or the inner obtusish, scarious-margined, not ciliate, the herbaceous tip shorter than the indurate base, much shorter in the innermost; rays 6 or more (8 to 10, according to DeCandolle), the lamina oval, 4 mm. long; receptacle fimbrillate; young disk achenes hispidulous, the pappus of about 10 oblong-linear obtuse squamellae, alternately unequal, 1.5 and 1.2 mm. long.

The name *Gutierrezia neaeana*, used by Schultz Bipontinus[19] in 1855 without very definite citation of synonym, is here given proper standing. Schultz's entire treatment was as follows: "Zu *Gutierrezia* müssen ausser den von A. Gray gezogenen Arten noch gerechnet werden:

" *Gutierrezia* (Brachyris) *paniculata* Sch. Bip.
" — — *Neaeana* Sch. Bip.
" — (Hemiachyris Schauer) *glutinosa* Sch. Bip."

Gutierrezia resinosa (Hook. & Arn.) Blake.

Galinsogea ? *resinosa* Hook. & Arn. Bot. Beechey Voy. 32. 1830.
Odontocarpha poeppigii DC. Prodr. **5**: 72. 1836.
Brachyris paniculata DC. Prodr. **5**: 313. 1836.
Gutierrezia paniculata A. Gray, Pl. Wright. **2**: 78. 1853, in text.
Bahia resinosa DC.; Hook. & Jacks. Ind. Kew. **1**: 264. 1893, as synonym of *Galinsoga resinosa*.

The types of *Galinsogea* ? *resinosa* Hook. & Arn., *Odontocarpha poeppigii* DC., and *Brachyris paniculata* DC. belong to the same species. *Gutierrezia linearifolia* Lag., type species of the genus, described as from Mexico, is perhaps identical, as has been suggested by Gray,[20] but in view of the insufficiency of the original description it would be unwise to take up this name for it at the present time.

Lepidophyllum phylicaeforme (Meyen) Hieron.; R. E. Fries, Nov. Act. Soc. Sci. Upsal. IV. **1**: 77. 1905.

Baccharis phylicaeformis Meyen, Reis. Erd. **2**: 31. 1835.
Parastrephia ericoides Nutt. Trans. Amer. Phil. Soc. n. ser. **7**: 450. 1841.
Vernonia phylicaeformis Walp. Nov.Act. Acad. Caes. Leop. Carol. **19**: Suppl. **1**: 252. 1843.

The genus *Parastrephia* Nutt.,[21] with the single species *P. ericoides*, was described from fragmentary specimens brought from near Arequipa by Cursor. It was said to have heterogamous heads with the outer flowers tubular, 5-toothed, and staminate, and the inner filiform, obliquely 2-toothed, and pistillate. The generic name (from παραστρέφω, to divert; "to invert," Nuttall) was given in allusion to this supposed inversion of the arrangement (pistillate flowers outside, hermaphrodite inside) which is universal in heterogamous heads of Asteraceae. As indicated by Bentham,[22] Nuttall's description must have been based on abnormal specimens or more probably on erroneous observation. The genus was retained by Bentham and Hooker, and placed in the Baccharideae next to *Baccharis*, Nuttall's species being equated with *Baccharis phylicaeformis* Meyen.

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[19] Flora **38**: 115. 1855.
[20] Syn. Fl. **1**[2]: 115. 1884.
[21] Trans. Amer. Phil. Soc. n. ser. **7**: 449. 1841.
[22] Benth. & Hook. Gen. Pl. **2**: 286. 1873.

O. Hoffmann [23] also retained the genus in the same position, with the suggestion that it might be a *Lepidophyllum*. When Hieronymus' herbarium transfer of Meyen's name was published by R. E. Fries, no reference was made to Nuttall's name. An examination of Nuttall's fragmentary type in the British Museum shows that his plant is a *Lepidophyllum* apparently identical in all features but one with a collection (*R. E. Fries* 675, from Argentina) distributed as *L. phylicaeforme* (Meyen) Hieron. In Nuttall's plant the stem is densely white-tomentose, as it is described in Meyen's original, which also came from Arequipa. *Fries* 675 has the stem and even the young branchlets glabrous and glutinous, and evidently represents Walpers' var. *lucida* of "*Vernonia phylicaeformis*." This plant, differing so far as is known only in its lack of tomentum, may prove to represent a distinct species, but the material at hand is entirely inadequate for decision. The generic name *Parastrephia* Nutt. (1841) can now be referred definitely to the synonymy of *Lepidophyllum* Cass. (1816).

Distasis heterophylla Hemsl. Biol. Centr. Amer. Bot. **2**: 119. 1881.

This little plant continues to be known only from the scanty original collection by Thomas Coulter (no. 406) from "Xalapa" (i. e. Jalapa, Veracruz). Gray considered that it "is hardly of this genus [*Chaetopappa*], probably not of the tribe." [24] Before its description by Hemsley, it was given critical mention by Bentham and Hooker,[25] who stated that the disk corollas were at least sometimes 4-merous and the pappus of 4 or 5 short lacerate paleae and 1 to 3 slender caducous awns. Hemsley described the disk corollas as 4 or 5-merous and the pappus as of 4 or 5 lacerate paleae with no seta or 1 (or 1 to 3 according to Bentham and Hooker). The writer's dissections of flowers from a fragment of a head of the type presented from Kew do not entirely agree with either of these accounts. In all flowers in place in the head, as well as in most of the loose ones, the pappus in both ray and disk consisted of several squamellae, about 0.4 mm. long, united into a cup and lacerate-fimbriate for nearly or quite their whole free length (about one-fifth to one-half the total length). In one ray flower a single hispidulous bristle about 1.5 mm. long was present. The achenes, none of which seemed perfectly mature, were 2 to 4-nerved and sparsely hirsute. The rays were tiny, about 2 or 3-seriate, the short erect ligule varying from oblong, 3-denticulate, and much shorter than the style to linear, entire, and subequal to the style. The style branches in the disk were oblong, with strong stigmatic lines and short obtuse depressed-triangular papillate appendages. The disk corollas were nearly always 5-merous, only a single 4-merous corolla being found. Among the loose flowers in the pocket was a little cluster of very young disk flowers with a pappus of 5 slender awns 2.4 mm. long alternating with 5 oblong fimbriate free squamellae about 0.4 mm. long. These agree very well with those of *Chaetopappa asteroides* DC. and apparently belong to that species and were accidently introduced into the pocket.

Distasis heterophylla differs from the three better known species of *Chaetopappa* in its numerous, 2 or 3-seriate, tiny rays with erect ligules (of unknown color, but probably white), and its trifid or pinnatifid leaves, as well as in its perennial duration. *Chaetopappa asteroides* var. *imberbis* A. Gray, a rare form, is described as lacking awns and having the pappus paleae sometimes coroniform-concreted. *D. heterophylla*, consequently, seems properly regarded as a member of the genus *Chaetopappa*, aberrant in the character of its rays but not meriting generic distinction.

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[23] In Engl. & Prantl, Pflanzenfam. 4[5]: 172. 1890.

[24] Syn. Fl. 1[2]: 165. 1884.

[25] Gen. Pl. **2**: 268. 1873, under *Distasis*.

The synonymy of this genus is involved. The first name given it, *Chaetanthera* Nutt.,[26] based on *C. asteroides* Nutt., had already been used by Ruiz and Pavon for a valid genus of Compositae. In an erratum slip bound in the copy of this volume in the library of the United States Department of Agriculture the name is corrected to *Chaetaphora* (sic), and the latter name is given in the index to the volume (p. 409), where *Chaetanthera* does not appear. This name also was preoccupied, having been used by Schrank (or Agardh), and also by Bridel (in the forms *Chaetophora* and *Chaetephora*). DeCandolle consequently renamed[27] the genus *Chaetopappa*, citing "Chaetophora Nutt. in litt. 1825" as a synonym. On a previous page DeCandolle [28] had published the genus *Distasis*, based on *D. modesta*. Soon afterward Rafinesque [29] published the genus *Diplostelma*, with three "species," all of which are reducible to *Chaetopappa asteroides*. In 1849 Gray [30] published "Diplostelma, Nov. Gen. (non Raf.)", based on *D. bellioides*, which he somewhat doubtfully regarded as a new genus closely allied to *Chaetopappa* but distinguished by various minor characters. His explanation of his use of a name, already employed by Rafinesque for a genus Gray regarded as a synonym of *Chaetopappa*, is of interest: "To avoid an increase of synonymy in case the discovery of intermediate forms should invalidate these distinctions, I have taken up for the name of this genus a superseded synonyme of Chaetopappa." The genera *Distasis* and *Chaetopappa* were regarded as distinct by Bentham and Hooker, who were followed by Hemsley, but were rightly united by Gray [31] in 1880. Gray unfortunately adopted the posterior name *Chaetopappa*. The use of the prior name *Distasis* is required by the American Rules, and the two following species should be referred to it.

Distasis asteroides (Nutt.) Kuntze, Rev. Gen Pl. **1**: 334. 1891, as *D. asterodes*.
Chaetanthera asteroides Nutt. Journ. Acad. Phila. **7**: 111. 1834.
Chaetopappa asteroides DC. Prodr. **5**: 301. 1836.
Chaetaphora asteroides Nutt. Journ. Acad. Phila. **7**: 409 (index). 1837.

Distasis parryi (A. Gray) Kuntze, Rev. Gen. Pl. **1**: 334. 1891.
Chaetopappa parryi A. Gray, Proc. Amer. Acad. **16**: 82. 1880.

Aster moranensis H. B. K. Nov. Gen. & Sp. **4**: 93. 1820.
Aster lima Lindl. in DC. Prodr. **5**: 230. 1836.
Aster lindenii Schultz Bip. in Seem. Bot. Voy. Herald 302. 1856.
Aster ehrenbergii Schultz Bip. in Seem. Bot. Voy. Herald 302. 1856.
Aster purpurascens Schultz Bip. in Seem. Bot. Voy. Herald 303. 1856.

The type of *Aster moranensis* H. B. K. (*Bonpland* 4113, from Moran) proves to be identical with the characteristic Mexican species almost universally known as *A. lima* Lindl. The types of *Aster lindenii* (*Linden* 1170), *A. ehrenbergii* (*C. Ehrenberg* 791b and 747, from "prope Regle"), and *A. purpurascens* Schultz Bip. (*C. Ehrenberg* 474), all in the Schultz Bipontinus Herbarium, belong to the same species. Schultz's three species were described as "species vel varieties" allied to *A. lima*. The color of the rays in this species is not definitely known, and may be variable. Lindley says they are purple, but Kunth and Schultz describe them as white. Not improbably they are normally white at first, turning purplish in age, as in some other species of *Aster*.

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[26] Journ. Acad. Phila. **7**: 111. 1834.
[27] Prodr. **5**: 301. 1836.
[28] Prodr. **5**: 279. 1836.
[29] New Fl. N. Amer. **2**: 44. "1836" (1837).
[30] Mem. Amer. Acad. n. ser. **4**: 72, footnote. 1849.
[31] Proc. Amer. Acad. **16**: 82. 1880.

Bentham and Hooker[32] referred *A. "limae," A. lindenii*, and *A. ehrenbergii* Schultz Bip. to *A. riparius* H. B. K., but apparently incorrectly. Gray[33] treats *A. riparius* as a species of southern Arizona and Mexico, with the synonym *A. sonorae* A. Gray.

Erigeron spathulatus Vahl in West, Bidr. Beskr. St. Croix 303. 1793.

Erigeron chinensis Jacq. Pl. Hort. Schönbr. **3**: 30. *pl. 303*. 1798.

Conyza apurensis H. B. K. Nov. Gen. & Sp. **4**: 73. 1820.

Erigeron apurensis Griseb. Fl. Brit. W. Ind. 365. 1861.

The type (*Bonpland*, from Rio Apure, in humidis) of *Conyza apurensis* H. B. K. proves to be identical with the common tropical American *Erigeron spathulatus* Vahl, and the name can now be referred to the synonymy of that species. Grisebach, who transferred *Conyza apurensis* to *Erigeron*, recorded it from St. Vincent, Trinidad, and Mexico to Venezuela. *Erigeron spathulatus* Vahl he listed only from Antigua and the Virgin Islands. His descriptions of the two species agree closely in practically every feature, the only difference of any apparent consequence being the key character of pappus (1-serial in *E. spathulatus*, 2-serial, with outer series minute, in *E. apurensis*). Study of material of the plant commonly called *Erigeron spathulatus* from various localities, including the island of St. Croix (the type locality), shows that the long bristles of the essentially 1-seriate pappus are interspersed with a few very short ones, and that in addition there are often overlapping hairs from the apex of the achene which suggest a minute setaceous exterior pappus as described by Grisebach for *E. apurensis*. There seems no reason to doubt that the distinction attempted by Grisebach had no basis in fact, and that his *E. spathulatus* and *E. apurensis* are to be united under the earlier name, *E. spathulatus* Vahl.

Hauman-Merck[34] has adopted for this species the name *Erigeron chinensis* Jacq., considering *E. spathulatus* as a "synonyme de *E. chinensis*, d'après Hieronymus (Herb. de Berlín)." Jacquin's species, based on plants grown from seed sent from the Cape of Good Hope and said to be originally from China, certainly agrees well enough both as to description and plate with *E. spathulatus*. As his name is several years later than Vahl's, it is fortunately not necessary to adopt it. It was used by Baker,[35] who gave *Conyza apurensis* and *Erigeron apurensis* as synonyms, but did not mention *E. spathulatus*.

Baccharis glutinosa Pers. Syn. Pl. **2**: 425. 1807.

Molina viscosa Ruiz & Pav. Syst. Veg. Peruv. Chil. 207. 1798. Not *Baccharis viscosa* Lam. 1783.

Baccharis coerulescens DC. Prodr. **5**: 402. 1836.

Baccharis alamani DC. Prodr. **5**: 402. 1836.

Baccharis longifolia DC. Prodr. **5**: 402. 1836.

The types of *Baccharis coerulescens* (*Berlandier* 2343), *B. alamani* (*Alamán*), and *B. longifolia* DC. (*Berlandier* 624 and 653) have been examined by the writer and found to be referable to the common *Baccharis glutinosa*. The first two have commonly been so referred, but the last was apparently first placed in the synonymy of *B. glutinosa* by the writer[36] in 1926.

Bacccharis pilularis DC. Prodr. **5**: 407. 1836.

Baccharis consanguinea DC. Prodr. **5**: 408. 1836.

Baccharis congesta DC. Prodr. **5**: 410. 1836.

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[32] Gen. Pl. **2**: 272. 1873.

[33] Syn. Fl. **1**[2]: 202. 1884.

[34] Anal. Mus. Nac. Buenos Aires **24**: 423. 1913.

[35] In Mart. Fl. Bras. **6**[3]: 31. 1884.

[36] Blake in Standl. Contr. U. S. Nat. Herb. **23**: 1506. 1926.

Examination of the type of *Baccharis congesta* DC. ("Mexico ad Real del Monte," *Haenke*) shows that it is to be referred to the Californian *B. pilularis* DC., and that, like so many of Haenke's plants, it was mislabelled as to locality. A similar error has been shown by Gray in the case of *B. haenkei* DC., also described from "Real del Monte," when in fact it is *B. douglasii* DC. and was undoubtedly collected in California. The descriptions indicate that *B. pilularis* was based on the procumbent form of the species, *B. consanguinea* and *B. congesta* on the erect one.

Baccharis squarrosa H. B. K. Nov. Gen. & Sp. **4**: 67. 1820.

Baccharis seemanni A. Gray, Proc. Amer. Acad. **15**: 33. 1879.

The type of *Baccharis squarrosa*, from Guanajuato, is the same species as *B. seemanni* A. Gray. It bears an annotative label written by Dr. Gray in May, 1887, on his last voyage to Europe, suggesting that it be compared with that species. The equation of the two names was made by the writer, without discussion, in Standley's "Trees and shrubs of Mexico." [37]

Baccharis thesioides H. B. K. Nov. Gen. & Sp. **4**: 61. 1820.

Baccharis ptarmicaefolia DC. Prodr. **5**: 419. 1836.

Baccharis sulcata DC. Prodr. **5**: 419. 1836.

Examination of the types of *Baccharis ptarmicaefolia* (*Berlandier* 572) and *B. sulcata* DC. (*Mendez*) shows that both are properly placed in the synonymy of *B. thesioides* H. B. K. *Baccharis ptarmicaefolia* was so referred by Gray in the Synoptical Flora, and *B. sulcata* by the writer.[38] The type of the latter is the narrowest-leaved form of the species, with linear or barely linear-oblanceolate leaves up to 3.7 cm. long and 3 mm. wide, bearing 3 to 6 pairs of sharp teeth above the middle.

Archibaccharis serratifolia (H. B. K.) Blake.

Baccharis serratifolia H. B. K. Nov. Gen. & Sp. **4**: 59. 1820.

Baccharis mucronata H. B. K. Nov. Gen. & Sp. **4**: 60. 1820.

Baccharis micrantha H. B. K. Nov. Gen. & Sp. 4: 60. 1820.

Pluchea floribunda Hemsl. Diag. Pl. Mex. **2**: 32. 1879.

Hemibaccharis mucronata Blake, Contr. U. S. Nat. Herb. **20**: 550. 1924.

Archibaccharis mucronata Blake in Standl. Contr. U. S. Nat. Herb. **23**: 1508. 1926.

The name *Baccharis mucronata* H. B. K. has been in current use for a common Mexican species now referred to the closely related genus *Archibaccharis* Heering (*Hemibaccharis* Blake), while the identity of *B. serratifolia* and *B. micrantha* has apparently never been ascertained. Examination of the types in the Paris Herbarium, all of which are staminate, shows that all three are conspecific. Owing to priority of position, the name to be adopted for the species is unfortunately *Baccharis serratifolia*, rather than the well known *B. mucronata*. The types of the first two came from the State of Guanajuato, between Santa Rosa and Los Ioares, and that of the third from near the city of Guanajuato.

Pluchea odorata (L.) Cass. Dict. Sci. Nat. **42**: 3. 1826.

Conyza odorata L. Syst. Nat. ed. 10. **2**: 1213. 1759.

Conyza cortesii H. B. K. Nov. Gen. & Sp. **4**: 75. 1820.

Pluchea cortesii DC. Prodr. **5**: 452. 1836.

The writer's doubtful reference [39] of *Conyza cortesii* H. B. K. to the synonymy of *Pluchea odorata* has been confirmed by examination of the type (*Bonpland*

[37] Contr. U. S. Nat. Herb. **23**: 1505. 1926.

[38] In Standl. Contr. U. S. Nat. Herb. **23**: 1506. 1926.

[39] In Standl. Contr. U. S. Nat. Herb. **23**: 1510. 1926.

3982, from Cuernavaca) in the Humboldt and Bonpland Herbarium at Paris. Hemsley [40] listed the species in full both as *Conyza cortesii* and as *Pluchea cortesii*.

Pluchea salicifolia (Mill.) Blake.

Conyza salicifolius (*salicifolia* in errata) Mill. Gard. Dict. ed. 8. *Conyza* no. 6. 1768.

Baccharis adnata Humb. & Bonpl.; Willd. Enum. Pl. **2**: 870. 1809.

Conyza adnata H. B. K. Nov. Gen. & Sp. **4**: 74. 1820.

Pluchea subdecurrens Cass. Dict. Sci. Nat. **42**: 4. 1826.

Pluchea adnata Mohr, Contr. U. S. Nat. Herb. **6**: 790. 1901.

Conyza salicifolia was described by Miller from Veracruz, with the citation of a polynomial name from Houstoun's manuscript. The specimen from Houstoun in the Banksian Herbarium mentioned by Britten [41] was not found by the writer, but the other specimen of the species from Houstoun in the Sloane Herbarium (vol. 292, folio 67) was found to be a good match for *Purpus* 3121, a characteristic example of the plant usually known as *Pluchea subdecurrens*. Miller's name, which is sufficiently defined by his description, must consequently be adopted for the species.

Delilia biflora (L.) Kuntze, Rev. Gen. Pl. **1**: 333. 1891, as *Delilea*.

Milleria biflora L. Sp. Pl. 919. 1753.

Milleria triflora Mill. Gard. Dict. ed. 8. *Milleria* no. 4. 1768.

Delilia berterii Spreng. Bull. Soc. Philom. **1823**: 54. *pl. 1* [=2]. 1823.

Meratia sprengelii Cass. Dict. Sci. Nat. **30**: 66. 1824.

Elvira martyni Cass. Dict. Sci. Nat. **30**: 68. 1824.

Elvira biflora DC. Prodr. **5**: 503. 1836.

Milleria trifolia Hook. & Jacks. Ind. Kew. **2**: 238. 1894, sphalm.

The name *Elvira* Cass., in general use for a century for a small genus of the tribe Millerinae, must give way to *Delilia* Spreng., proposed a year earlier. Sprengel's type, grown from seed collected by Bertero on the Río Magdalena, Colombia, has been examined by the writer in the Schultz Bipontinus Herbarium. Through some error of observation Sprengel described the single achene in the 3-flowered head as bearing at its apex one pistillate and two hermaphrodite corollas, on which account he suggested the group name Synanthae for the "tribus seu ordo singularis" which he took it to represent among the Compositae. Cassini, who knew the plant only from Sprengel's description and plate, a year later corrected Sprengel's remarkable error and recognized the true affinity of the plant, but was led to retain the genus as distinct from *Elvira*, which he proposed at the same time for *Milleria biflora* L. There being already a genus *Lilaea* dedicated to the same botanist that Sprengel sought to honor, Cassini deemed it proper to rename the genus and species, but his own choice of name was unfortunate, there being an earlier *Meratia* of Loiseleur (1818). Kuntze, without examining Sprengel's publication, took up his name for the genus (misspelling it *Delilea*) on the basis of Cassini's discussion.

Miller's type of *Milleria triflora*, collected at "Campeachy" by Robert Millar and now in the British Museum, is also referable to *Delilia biflora*. His name apparently has not previously been referred to synonymy. In the Index Kewensis it is given as *Milleria trifolia*.

Milleria quinqueflora L. Sp. Pl. 919. 1753.

Milleria glandulosa DC. Prodr. **5**: 503. 1836.

The type of *Milleria glandulosa* DC. (*Berlandier* 955, collected at Cuernavaca, Morelos, Mexico, October 20, 1827), examined by the writer in the Prodromus Herbarium, is ordinary *M. quinqueflora* L.

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[40] Biol. Centr. Amer. Bot. **2**: 126, 133. 1881.

[41] Journ. Bot. Brit. & For. **36**: 52. 1898.

Clibadium sylvestre (Aubl.) Baill. Hist. Pl. **8**: 307. 1882.

Baillieria sylvestris Aubl. Pl. Guian. **2**: 807. 1775.

Baillieria barbasco H. B. K. Nov. Gen. & Sp. **4**: 288. 1820.

Clibadium vargasii DC. Prodr. **5**: 506. 1836.

The types of *Clibadium vargasii* DC. (*Vargas* 13, Caracas) and *Baillieria barbasco* H. B. K. (*Humboldt & Bonpland*, "in umbrosis Javitae,") belong to *C. sylvestre*. The name *B. barbasco* was omitted from O. E. Schulz's revision of the genus *Clibadium*.[42] The identification of Aublet's type of *Baillieria sylvestris* has been discussed by the writer.[43]

Ichthyothere linearis (Benth.) Baker in Mart. Fl. Bras. **6**[3]: 154. 1884.

Latreillea linearis Benth. Ann. Nat. Hist. **2**: 110. 1839.

Ichthyothere angustifolia Glaz. Mém. Soc. Bot. France **3**: 408. 1910, nomen nudum.

Examination of the type number of *Ichthyothere angustifolia* Glaz. (*Glaziou* 21572, from "Guabiroba, au Morro Cubatao, Goyaz," in the Paris Herbarium), a name published without description, shows it to be referable to *I. linearis* (Benth.) Baker, the type of which (*Pohl* 472) has also been examined.

Ichthyothere terminalis (Spreng.) Blake, Journ. Washington Acad. Sci. **11**: 301. 1921.

Rolandra terminalis Spreng. Syst. Veg. **3**: 673. 1826.

Broteroa trinervata DC. Prodr. **5**: 636. 1836, as to specimens cited, not as to description.

Sprengel's type (Brazil, "*Otto*"), no. 1932 in his herbarium, has been examined in the Schultz Bipontinus Herbarium. Although DeCandolle's description of *Broteroa trinervata* (*Nauenbergia trinervata* Willd.,[44] *Brotera trinervata* Pers.[45]) agrees with *Flaveria trinervia* (Spreng.) Mohr, to which it is usually referred, the specimens so labeled in the Prodromus Herbarium (*Vargas* 239, evidently the principal basis of DeCandolle's citation of specimens; also *Schomburgk* 247 of 1838 and two other sheets, one numbered 238, without collector's name [collected by Vargas?], the other unlabeled) are all *Ichthyothere terminalis*.

Polymnia connata (Spreng.) Blake.

Gymnolomia connatum Spreng. Syst. Veg. **3**: 610. 1826.

Polymnia silphioides DC. Prodr. **5**: 516. 1836.

Sprengel's *Gymnolomia connatum*, like many others of his briefly described new species of Compositae, has remained unidentified. It was described as from "Brasil. Sello," but the type, now in the Schultz Bipontinus Herbarium, is labeled "Monte Video." Its identity with *Polymnia siliphioides* DC. is noted by Schultz on the label of the type.

Baltimora recta L. Mant. Pl. 288. 1771.

Wedelia populifolia Hook. & Arn. Bot. Beechey Voy. 435. 1841.

Baltimora scolospermum Steetz in Seem. Bot. Voy. Herald. 154. 1853.

Baltimora scolospermum var. *panamensis* Steetz in Seem. Bot. Voy. Herald 154. 1853.

Melampodium bonairense Boldingh, Fl. Dutch W. Ind. **2**: 107. *pl. 9*. 1914.

Baltimora ovata Rusby, Descr. New S. Amer. Pl. 151. 1920.

Examination of the types or authentic specimens of *Wedelia populifolia* (Realejo, Nicaragua, *Sinclair*, in Kew Herbarium), *Baltimora scolospermum* var. *panamensis* Steetz (*Seemann* 59, Panama, British Museum), *Melampodium bonairense*

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[42] Bot. Jahrb. Engler **46**: 613–628. 1912.

[43] Contr. Gray Herb. **52**: 4. 1917.

[44] Sp. Pl. **3**: 2393. 1803.

[45] Syn. Pl. **2**: 498. 1807.

Boldingh (*Boldingh* 7401, a cited specimen but not the type collection, in Kew Herbarium and Paris Museum), and *Baltimora ovata* Rusby (*Herbert H. Smith* 536, near Santa Marta, Colombia, N. Y. Bot. Gard.) has shown that all are referable to the synonymy of the widespread and weedy *Baltimora recta* L., described by Linnaeus from specimens grown at the Upsala garden and supposed to have originated in "Marilandia, ad urbem Baltimore." This species, which ranges from Mexico to the West Indies and south to Brazil, but has never been recorded with certainty from the United States, is somewhat variable in size of head and decidedly so in respect to the presence or absence of tubercles or wings on the fruit, but the differences seem purely individual and not correlated with geographic areas. Plukenet's figure (Mantissa, pl. 342, sixth figure) cited by Linnaeus for this plant, certainly belongs to *Verbesina occidentalis* (L.) Walt., to which (as *Sigesbeckia occidentalis*) it was referred by Linnaeus in the second edition of the Species Plantarum. Numerous other synonyms, long known to belong to this species, are here omitted. Some years ago the U. S. National Herbarium received specimens collected in eastern Java in 1920 by C. A. Backe, accompanied by the statement that the plant has run wild in that region.

Franseria artemisioides Willd. Sp. Pl. **4**: 378. 1805.

Ambrosia arborescens Mill. Gard. Dict. ed. 8. *Ambrosia* no. 5. 1768. Not *Franseria arborescens* T. S. Brandeg. 1903.

Xanthium fruticosum L. f. Suppl. Pl. 418. 1781. Not *Franseria fruticosa* Phil. 1891.

Ambrosia frutescens Lam. Encycl. **1**: 128. 1783, as synonym.

Miller's *Ambrosia arborescens* was grown at Chelsea from seed, originally from "Peru," sent him by Bernard de Jussieu. His specimen in the British Museum, labeled "Hort.," is of the present species, as is the specimen of *Xanthium fruticosum* L. f. in the Linnaean Herbarium. In the Index Kewensis Miller's name is left as a valid species, while *Ambrosia arborescens* of Lamarck[46] is referred to *Franseria artemisioides*. Lamarck attributes the name to Miller's Gardeners Dictionary, however, and his plant is identical with that of Miller. The Paris Royal Gardens name, *Ambrosia frutescens*, cited by Lamarck as a synonym, is omitted from the Index Kewensis.

Laxmannia arborea J. & G. Forst. Char. Gen. Pl. 94. *pl. 47*. 1776.

Petrobium arboreum R. Br.; DC. Prodr. **5**: 502. 1836.

Pharetranthus ferrugineus Klatt, Flora **68**: 204. 1885.

The uncertainty attaching to the locality where Cuming collected his no. 2454, on which Klatt based his genus *Pharetranthus*, has been discussed by Dr. B. L. Robinson.[47] The plant in question has been known almost universally as *Petrobium arboreum* R. Br., but its correct name, as Dr. Robinson has shown, is *Laxmannia arborea*. Klatt attributed the plant to the Philippine Islands, whereas it is definitely known only from St. Helena. The sheet in the Schultz Bipontinus Herbarium is accompanied by a handwritten label, "Cuming 2454 Pl. Ins. Philippin."; but another label, in an unrecognized hand, bears the correction: "Petrobium arboreum. Ins. St. Helena nec Philippin." A specimen of the same number at Kew is marked "Petrobium arboreum. St. Helena–Cuming 1841" in Bentham's hand on the original label. Any possible doubt remaining as to the locality of *Cuming* 2454 is removed by the list of his collecting localities given in Merrill's excellent account[48] of his life, where it is shown that the general

[46] Encycl. **1**: 128. 1783.

[47] Proc. Amer. Acad. **47**: 207–208. 1911.

[48] E. D. Merrill, "Hugh Cuming's letters to Sir William J. Hooker," Philippine Journ. Sci. **30**: 153–185. *pl. 1*. 1926.—List of localities, p. 175.

label "Ins. Philippinae 1841" was used for all his plants, including those from the Philippines, Malay Peninsula, Singapore, Sumatra, and St. Helena, and that Nos. 2444 to 2464 were collected on St. Helena.

Tragoceros americanum (Mill.) Blake.

Calendula americana Mill. Gard. Dict. ed. 8. *Calendula* no. 10. 1768.

Tragoceras microglossum DC. Prodr. **5**: 533. 1836.

The type of Miller's *Calendula americana* in the British Museum, collected at "Vera Cruz" by William Houstoun or grown by Miller from seed sent by him, is identical with *Pringle* 2450 and *Rose* 3672, both from Jalisco. The second specimen mentioned has also been compared by the writer with the type of *Tragoceras microglossum* DC. (*Mendez*, "prov. Leonina ultra Guanaxato") and found identical. It is doubtful whether *T. schiedeanum* Less. be not a form of the same species with slender-pediceled heads.

Philactis zinnioides Schrad. "Ind. Sem. Hort. Goett. 1831;" Linnaea **8**: Litt. 24. 1833.

Grypocarpha hebeclada Blake, Contr. Gray Herb. **52**: 35. 1917.

The identity of the genus *Philactis* Schrad.,[49] based on the single species *Philactis zinnioides* (from Mexico, *Spangenberg*), has remained a puzzle to subsequent students of Asteraceae. In Bentham and Hooker's Genera Plantarum, and in Engler and Prantl's Naturlichen Pflanzenfamilien, it is associated with *Tragoceros* and *Zinnia*, and is distinguished by its combination of elongate receptacle, sterile disk, and aristate achenes. The examination of an authentic specimen (*Schrader*, Hort.Gotting., 1832) in the Prodromus Herbarium, together with a copy of the excellent unpublished plate referred to by DeCandolle,[50] has revealed its identity with *Grypocarpha hebeclada* Blake. The description of the disk flowers as sterile, which has helped to conceal its identity, was due to their failure to produce fruit under conditions of cultivation. The young achenes in Schrader's specimen have every appearance of being fertile, as they are in wild specimens. A specimen of *Galeotti* 2468 (Oaxaca, altitude 1525 to 2135 meters), in the general collection of the Delessert Herbarium, belongs to the same species.

The only other species that has been referred to *Philactis* is *P. longipes* A. Gray, which is properly a *Heliopsis* and to be known as *Heliopsis longipes* (A. Gray) Blake.[51]

Philactis consists of three closely related species, which are keyed and briefly described [52] under *Grypocarpha* in the writer's treatment of the Asteraceae in Standley's "Trees and shrubs of Mexico". The generic names *Sanvitaliopsis* Schultz Bip.[53] and *Grypocarpha* Greenm.[54] must now be referred to the synonymy of *Philactis*, and the two species following transferred to it.

Philactis liebmannii (Klatt) Blake.

Zinnia liebmannii Klatt, Leopoldina **23**: 89. 1887.

Sanvitaliopsis liebmannii Schultz Bip.; Klatt, Leopoldina **23**: 89. 1887, as synonym.

Grypocarpha liebmannii Blake, Contr. Gray Herb. **52**: 35. 1917.

Melanthera fruticosa T. S. Brandeg. Univ. Calif. Publ. Bot. **10**: 421. 1924.

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[49] "Ind. Sem. Hort. Goett. 1831;" Linnaea **8**: Litt. 24. 1833.

[50] Prodr. **5**: 534. 1836.

[51] Contr. U. S. Nat. Herb. **22**: 608. 1924.

[52] Contr. U. S. Nat. Herb. **23**: 1527. 1926.

[53] *Sanvitaliopsis* Schultz Bip.; Benth. & Hook. Gen. Pl. **2**: 357. 1873, hyponym; Greenm. Proc. Amer. Acad. **41**: 261. 1905.

[54] *Grypocarpha* Greenm. in Sarg. Trees & Shrubs **1**: 145. *pl. 73*. 1903.

Philactis nelsoniii (Greenm.) Blake.

Grypocarpha nelsonii Greenm. in Sarg. Trees & Shrubs **1**: 145. *pl. 73.* 1903.
Sanvitaliopsis nelsonii Greenm. Proc. Amer. Acad. **41**: 261. 1905.

Zinnia maritima H. B. K. Nov. Gen. & Sp. **4**: 251. 1820.

Anaitis acapulcensis DC. Prodr. **5**: 629. 1836.

In Bentham and Hooker's Genera Plantarum [55] the monotypic genus *Anaitis* DC.[56] is referred to *Sanvitalia,* on the basis of De Candolle's description and of the examination of an authentic specimen in the Cosson Herbarium. This disposition of the genus is followed by O. Hoffmann in the Pflanzenfamilien. Examination of the type (*Haenke,* Acapulco) in the Prodromus Herbarium and of the better duplicate in the Schultz Bipontinus Herbarium, which is evidently the specimen referred to by Bentham and Hooker, shows that Bentham's identification was incorrect, and that *Anaitis acapulcensis* DC. is in fact a synonym of *Zinnia maritima* H. B. K., the type of which likewise came from Acapulco. The name *Anaitis* DC. must consequently take its place in the synonymy of *Zinnia,* not *Sanvitalia.*

Sigesbeckia flosculosa L'Hér. Stirp. Nov. 37. *pl. 19.* 1784.

Melampodium? dombeyanum DC. Prodr. **5**: 521. 1836.

Melampodium dombeyanum, based on a specimen in the Prodromus Herbarium collected by Dombey in Peru, was placed by DeCandolle among the "Species non satis notae" and has retained the same position to this day. Examination of the type, which is in very young flower, has shown its identity with *Sigesbeckia flosculosa.* The latter also was described from a Peruvian collection by Dombey.

Jaegeria hirta (Lag.) Less. Syn. Gen. Comp. 223. 1832.

Acmella hirta Lag. Gen. & Sp. Nov. 31. 1816.
Jaegeria mnioides H. B. K. Nov. Gen. & Sp. **4**: 278. *pl. 400.* 1820.
Spilanthes mariannae DC. Prodr. **5**: 623. 1836.
Jaegeria discoidea Klatt, Jahrb. Hamb. Wiss. Anst. **10**[2]: 126. 1893.

Jaegeria mnioides H. B. K. proves on examination of the type at Paris to be merely a dwarfed state of the common *Jaegeria hirta,* as already suggested by Dr. B. L. Robinson [57] in his revision of the genus. *Vauthier* 332 in the Prodromus Herbarium, type of *Spilanthes mariannae* DC., is *Jaegeria hirta,* although the name was referred by Baker [58] to *Spilanthes acmella* var. *uliginosa* (Swartz) Baker, and by A. H. Moore [59] to *Spilanthes ciliata* H. B. K. *Jaegeria discoidea* Klatt, based on *Pringle* 4279 and retained as a species by Dr. Robinson, is merely a dwarf state of *J. hirta,* with subsessile heads.

Eclipta alba (L.) Hassk. Pl. Jav. Rar. 528. 1848.

Verbesina alba L. Sp. Pl. 901. 1753.
Verbesina conyzoides Trew, Pl. Rar. 8. *pl. 6.* 1763.
Eclipta erecta L. Mant. Pl. 286. 1771.
Wiborgia ? oblongifolia Hook. Bot. Misc. **2**: 226. 1831.
Galinsoga ? oblongifolia DC. Prodr. **5**: 677. 1836.

In Robinson and Greenman's revision of *Verbesina,* the name *Verbesina conyzoides* Trew was placed [60] among the doubtful species, the authors not having had opportunity to consult a copy of Trew's work. His plate, examined at Kew in 1925, is a good representation of *Eclipta alba,* and his name may now take its

[55] Gen. Pl. **2**: 358. 1873.
[56] Prodr. **5**: 628. 1836.
[57] Proc. Amer. Acad. **35**: 317. 1900.
[58] In Mart. Fl. Bras. **6**[3]: 233. 1884.
[59] Proc. Amer. Acad. **42**: 539. 1907.
[60] Proc. Amer. Acad. **34**: 564. 1899.

place in the extensive synonymy of that species. The plant is said to have been grown from unnamed seed from an unknown source. The type of *Wiborgia ? oblongifolia* Hook. at Kew, collected by Cruckshanks at Lurin, near Lima, Peru, belongs to the same species.

Eclipta bellidioides (Spreng.) Schultz Bip.

Jaegeria bellidioides Spreng. Syst. Veg. **3**: 591. 1826.

Eclipta elliptica DC. Prodr. **5**: 491. 1836.

Wollastonia prostrata DC. Prodr. **5**: 549. 1836.

The types of *Jaegeria bellidioides* (*Sellow*, Montevideo), *Eclipta elliptica* (*Herb. Imp. Bras.* 1024, Province Rio Grande, Brazil), and *Wollastonia prostrata* (*Herb. Imp. Bras.* 1073, from the same locality) are all conspecific. The identity of Sprengel's type was recognized by Schultz Bipontinus in 1857, but his name has remained unpublished.

Eclipta megapotamica (Spreng.) Schultz Bip.

Verbesina megapotamica Spreng. Syst. Veg. **3**: 578. 1826.

Eclipta lanceolata DC. Prodr. **5**: 491. 1836.

Sprengel's type, collected by Sellow "ad fl. magnum Amer. austr. (Rio Grande)," is identical with *Eclipta lanceolata* DC., which was based on a sheet of *Herb. Imp. Bras.* 1007 in the Paris Herbarium. Both have been examined by the writer. The identity of Sprengel's type, in this case as in that of the preceding species, was recognized by Schultz long ago, but his names ("in litt. ad cl. Asa Gray 1857") have remained unpublished.

Sclerocarpus baranguillae (Spreng.) Blake.

Melampodium baranguillae Spreng. Syst. Veg. **3**: 619. 1826.

Melampodium baranquillae DC. Prodr. **5**: 566. 1836, in synonymy.

Sclerocarpus columbianus Rusby & Blake in Blake, Contr. U. S. Nat. Herb. **22**: 609. 1924.

Examination of the type of *Melampodium baranguillae* Spreng., in the Schultz Bipontinus Herbarium, shows it to be identical with *Sclerocarpus columbianus* Rusby & Blake. Sprengel's type was collected by Bertero "ad fl. Magdalenae," and the type of *S. columbianus* came from Cienaga, near Santa Marta, Colombia, in the same region. The species is so closely similar to *S. africanus* Jacq. that DeCandolle's reference of *Melampodium baranquillae* to the synonymy of that plant is easily understood when specimens are compared. The material now at hand is scanty, consisting of one collection of *S. baranguillae* (*S. columbianus*) and two of *S. africanus*, but is sufficient to indicate the apparent distinctness of the two plants. There is no obvious difference in pubescence, foliage, or corollas, but the fruiting bracts and achenes of *S. africanus* are distinctly larger. In *S. africanus* the fruiting pales are 9 to 10 mm. long and the achenes 6.5 to 7 mm.; in *S. baranguillae* the pales are only 5 to 7 mm. long and the achenes 4 to 5.5 mm. For the present, then, the species may be recognized as distinct on the basis of these characters of the fruit. Their likeness in all other respects is so great, however, as to suggest that the apparent differences may be due only to lack of sufficient material, and that the two will be found indistinguishable when more specimens are brought together.

The occurrence in Columbia and in Africa of two plants so closely related, whether they eventually prove identical or not, raises an interesting question of plant distribution. *S. africanus* is recorded by Oliver and Hiern[61] from Upper Guinea, Cordofan (Kordofan), Abyssinia, Gallabat (Galabat), Mozambique District, and "perhaps introduced" in cornfields in India. In the "Flora o

[61] Fl. Trop. Afr. **3**: 374. 1877.

British India" it is recorded [62] from northern and central India and from both coasts of the Peninsula, reaching an altitude of about 1,675 meters in fields in the western Himalaya. It was originally described by Jacquin from plants cultivated at Vienna from Africa, without definite locality. DeCandolle suggested that the species was probably introduced from Africa into India and also into Colombia.[63] At the time he wrote the only definitely known species of the genus was *S. africanus*. Some 14 species are now known, all confined to North America and northern South America except *S. africanus* Jacq. and *S. discoideus* Vatke, the latter described from Abyssinia.

The propriety of referring *S. discoideus* Vatke to *Sclerocarpus* has been questioned by Bentham and Hooker and by Oliver and Hiern. It was named but not characterized by Schultz Bipontinus as a member of the genus *Guizotia*. Examination of *Schimper* 529 (the type collection) in the U. S. National Herbarium shows that the species can not be placed either in *Sclerocarpus* or in *Guizotia*. The plump, bluntly quadrangular, distinctly compressed achenes are at maturity nearly or completely enclosed in the boat-shaped pales, but these are open and not indurated even in age. The disk corollas and styles, moreover, are different from those of *Sclerocarpus*. The corollas are similar to those of *Guizotia*, but the style branches are very different, and the compressed (not obcompressed) achene excludes it from that genus. Comparison with various allied genera shows that the species can be placed in *Sigesbeckia* without requiring any change in the character of that genus beyond the admission of discoid heads, and it is accordingly here so referred.[64] It is most closely allied to *Sigesbeckia orientalis* (Schultz Bip.) Oliver & Hiern, in which the outer phyllaries are scarcely different in shape although very much smaller, shorter than or only slightly surpassing the disk. *Sclerocarpus africanus* remains the only presumably native Old World species of its genus.

Nearly all systematic works citing the name *Sclerocarpus* Jacq. base it on a double reference—Jacquin's Icones Plantarum Rariorum (1782) and his paper "Tria genera plantarum nova," published in 1787, usually quoted as from "Acta Helvetica vol. 9." DeCandolle attributes the genus to the latter work (the date of which he gives as 1786), and the species *S. africanus* to the former. The treatment in the first of these works [65] does not constitute publication of the genus or species under either the American or the International Rules of Nomenclature. The colored plate is merely a good habit figure, without details or dissections, and bears the name *Sclerocarpus africanus* and the reference "Act. helv. vol. 9." The text referring to the plate consists only of the following: "176 SCLEROCARPUS AFRICANUS. *Linn. syst. Act. helv. vol. 9.* Pars caulis florentis."

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[62] Hook. f. Fl. Brit. Ind. **3**: 305. 1880.

[63] O. Hoffmann, in Engl. & Prantl, Pflanzenfam. **4**[5]: 232. 1890, attributed to *S. africanus* the range: "Im östlichen und westlichen tropischen Afrika einheimisch und auch in Ostindien and Westindien gefunden, dort vermutlich eingeschleppt." I have found no evidence that the species occurs in either the East or West Indies, and Hoffmann's range as quoted is apparently a very incorrect rendering of that given by DeCandolle.

[64] **Sigesbeckia discoidea** (Vatke) Blake. *Guizotia discoidea* Schultz Bip. in Schweinf. Beitr. Fl. Aethiop. 150. 1867, nomen nudum. *Sclerocarpus discoideus* Vatke, Linnaea **39**: 495. 1875.—Schultz mentioned only a collection made by Schimper at Debra-Eski, altitude 9,300 feet, in 1850. This collection was not referred to by Vatke, who based his description on *Schimper* 529, from Mount Arba Tensesa, collected in 1862, but he cited Schultz's name in synonymy.

[65] Jacq. Icon. Pl. Rar. **1**: 17. *pl. 176.* 1782.—The title page is dated 1781–1786. The date of *Sclerocarpus* is given by Pfeiffer and others as 1782.

Under Canons 10 and 9 of the American Rules (1906), and Articles 37 and 38 of the Vienna Rules, neither the genus nor the species is effectively published at this place, both references given by Jacquin being to works at that time unpublished. In the second reference mentioned [66] a full description of *Sclerocarpus africanus* is given, accompanied by rather good figures of the head and floral parts. An earlier publication of the genus and species is found in Murray's edition [67] of the Systema Vegetabilium in 1784, and it is from this place that the genus *Sclerocarpus* and the species *Sclerocarpus africanus* must be cited, according to modern rules of nomenclature. DeCandolle, Bentham and Hooker, Gray, the Index Kewensis, and Dalla Torre and Harms cite *Sclerocarpus* from p. 34 of the Acta Helvetica, where the description begins, but the name first appears on p. 36 ("Habetur in horto sub titulo *Sclerocarpi africani*, nomine imposito a duritate calycis fructescentis, & a loco natali"), and should be cited from that place.

Murray attributes the authorship of *Sclerocarpus* to "Jacq. jun. in act. helv. v. 9. tab. . . . . fig. 1." *S. africanus* he cites from Jacq. Icon. Pl. Rar. The attribution of the genus to Jacquin filius is based on error. At the head of the title of the article in which *Sclerocarpus* is published stands the word "ejusdem," referring to the previous article. This bears the title "Lacerta vivipara, observatio Jos. Francisci de Jacquin, Nicol. Jos. fil.," and a footnote informs the reader that the observations on a vivaparous lizard which form its subject were made by the younger Jacquin at the tender age of 11, and are printed as an example to youthful minds. It is sufficiently evident from the substance of the following article ("Tria genera plantarum nova") and the fact that it was communicated in 1780 that it was the work of Jacquin père and not of the son (who was born in 1766), and Murray's attribution of the genus to Jacquin filius, at the time of its first effective publication, may be disregarded as a self-evident error. It is plain from the incomplete citations given by Jacquin and Murray that they were informed of each other's unpublished works, but is is clear that Murray's edition of the Systema appeared before the paper in the Nova Acta Helvetica.

Montanoa arborescens (DC.) Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 406. 1864.

Montagnaea arborescens DC. Prodr. **5**: 565. 1836.

Eriocoma arborescens Alamán; DC. Prodr. **5**: 566. 1836, as synonym.

Montanoa floribunda Cerv.; DC. Prodr. **5**: 566. 1836, as synonym. Not *M. floribunda* (H. B. K.) Schultz Bip. 1864.

Montanoa uncinata Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 406. 1864.

Eriocoma uncinata Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

In Robinson and Greenman's revision of *Montanoa*, *M. arborescens* (DC.) Schultz Bip. was placed [68] next to *M. frutescens* (Mair.) Hemsl., on the basis of the original description, and distinguished from the latter chiefly by the inflexed tips of the pales. Later, after examination of the type, Dr. Robinson [69] stated that the tips of the pales were actually reflexed, and that he had not been able to match the plant among recent Mexican collections. The species is represented in the Prodromus Herbarium by specimens from Alamán, Mairet, and Berlandier (no. 1006, a mere fragment), all of which are cited in the original description. The writer can find no characters to distinguish *M. arborescens* from *M. uncinata*

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[66] Nov. Act. Helv. **1**: 36. *pl. 2, f. 1.* 1787.—This took the place of the unpublished "Act. helv. vol. 9" cited by Jacquin and by most subsequent authors. Jacquin's paper is accompanied by an editorial footnote stating that it was communicated in 1780 for insertion in the ninth volume of the Acta.

[67] Murr. Syst. Veg. ed. 14. 783. 1784.

[68] Proc. Amer. Acad. **34**: 515. 1899.

[69] Proc. Amer. Acad. **36**: 487. 1901.

Schultz Bip. (the type collection of which, *Liebmann* 484, has been available for examination in a loan from the herbarium at Copenhagen), a species well represented from southern Mexico in the U. S. National Herbarium. In Schultz's herbarium the sheet of *M. uncinata* is in a cover labeled *M. arborescens* DC., an indication that he himself had later come to the conclusion that the two were identical.

Montanoa frutescens (Mair.) Hemsl. Biol. Centr. Amer. Bot. **2**: 165. 1881.

Montagnaea frutescens Mair.; DC. Prodr. **5**: 565. 1836.

Aldama montanoa Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 406, footnote. 1864.

The curious statement by Koch that *M. frutescens* Mair. had been found on careful investigation to be not a *Montanoa*, but an *Aldama* (i. e. *Sclerocarpus*), is explained by the material in Schultz's herbarium. This consists of five specimens from Virlet d'Aoust collected in San Luis Potosi about 1851, and one collected by Karwinski at Toliman in 1827, accompanied by a note affirming its identity with *Montagnaea frutescens* DC. on the basis of a specimen in the Munich herbarium collected by Karwinski. All these specimens belong to the species long afterward described as *Sclerocarpus frutescens* by T. S. Brandegee. The real *Montanoa frutescens* (Mair.) Hemsl. is a valid species of *Montanoa*. As Schultz's new name was published without direct reference to these specimens, it must take its place as a straight synonym of *M. frutescens*.

Montanoa hibiscifolia (Benth.) Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 407. 1864.

Montagnaea hibiscifolia Benth. in Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1852**: 89. 1852.

Eriocoma hibiscifolia Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

Montanoa wercklei Berger, Gard. Chron. III. **50**: 122. 1911.

Montanoa wercklei Berger, described from specimens grown at Sir Thomas Hanbury's garden at La Mortola from Costa Rican seed received from Wercklé, is represented in the Kew Herbarium by three sheets from La Mortola collected in 1908, 1910, and 1912. It is merely a garden form of *M. hibiscifolia* with flowers somewhat larger than usual, although they can be matched by wild Costa Rican specimens, for instance *J. D. Smith* 7072 (*Tonduz* 8478) in the United States National Herbarium. On account of its comparatively large flowers, the species was wrongly associated in the original description with *Montanoa grandiflora* (DC.) Schultz Bip. The vernacular name of *M. wercklei* is given as "toona quirita."

Montanoa leucantha (Lag.) Blake.

Rudbeckia leucantha Lag. Gen. & Sp. Nov. 32. 1816.

Montanoa crenata Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 407. 1864.

Eriocoma crenata Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

Montanoa purpurascens Robins. & Greenm. Proc. Amer. Acad. **34**: 515. 1899.

Rudbeckia leucantha Lag. was very briefly described from specimens cultivated at the Madrid garden from seeds introduced in 1804 by Sessé, and its generic identity has remained a mystery. It is represented in the Schultz Bipontinus Herbarium by a flowering branch collected in the Madrid garden in 1820, which agrees perfectly with Lagasca's short description and may unquestionably be taken as authentic for the species. Though immature, this specimen clearly represents the species later described as *Montanoa purpurascens* Robins. & Greenm. The type of *Montanoa crenata* Schultz Bip. (*De Berghes*, Mexico), a somewhat more satisfactory specimen, belongs to the same species. In both specimens the young pales are ciliate below, subglabrous or glandular on back, and provided with a rather abrupt, erect, spinescent tip, precisely as in young pales of *M. purpurascens*.

Montanoa mollissima Brongn.; J. Groenland, Revue Hort. IV. **6**: 543. *f. 165.* 1857.

Eriocoma mollissima Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

Montanoa tehuacana Robinson, Proc. Amer. Acad. **47**: 209. 1911.

Montanoa mollissima Brongn. is represented in the Schultz Bipontinus Herbarium by two sheets labeled "Montagnea mollissima Ad. Brongn. in H. P./H. P. 1851. Seminibus/mexicanis./d. Spach 1855." There are also two sheets in the general herbarium at Paris collected in the Garden and dated 1865. All these are identical with the strongly marked species *Montanoa tehuacana* Robinson, which is definitely known only from the State of Puebla. The original description, which is accompanied by a characteristic figure, states that seeds were sent from Mexico by Ghiesbreght ("Giesbreght") in 1843, and that the plant first flowered in the Garden in the following year. It was considered an important addition to horticulture. The plant is still grown as a garden ornamental in southern Europe, and also at Kew, where it is treated as a greenhouse shrub. It was figured in the Botanical Magazine in 1907 and redescribed by Mr. J. Hutchinson.[70]

Montanoa olivae Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 406. 1864.

?*Montagnaea karvinskii* DC. Prodr. **5**: 565. 1836.

?*Montanoa karwinskyi* Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 407. 1864.

Montanoa gracilis Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 407. 1864.

Montanoa subtruncata A. Gray in S. Wats. Proc. Amer. Acad. **22**: 424. 1887.

Eriocoma gracilis Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

?*Eriocoma karwinskyi* Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

Eriocoma olivae Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

On account of the characterization of the pales as completely glabrous in the very brief and incomplete original description of *Montanoa olivae*, Robinson and Greenman suggested that it might really belong to some other genus. The type (*Oliva* 347, from near Guadalajara, Sept. 1855) proves, however, to have slightly pubescent pales and to be identical with *M. subtruncata* A. Gray, being an excellent match for *Pringle* 11550. The pales in this species are often so nearly glabrous that they might easily be so described.

Montanoa gracilis Schultz Bip. was more fully described by Klatt,[71] who gave the type locality as "S. Miguel, La Grabra," which has been copied by subsequent authors. The species is represented in the Schultz Herbarium by a leaf and a couple of flowering heads, labeled "San Miguel, La Gabra." In the Copenhagen Herbarium is a sheet of the type collection (*Liebmann* 633, from S. Miguel, La Galera, Oct. 1842), which proves that the long doubtful species is identical with *M. olivae*.

It is probable that *Montanoa karvinskii* (DC.) Schultz Bip. is also identical with *M. olivae* (*M. subtruncata*). The type, collected by Karwinski in Mexico without definite locality, is in young flower with no pales visible. The larger leaves are all broken or eaten on the margin, and there is no proof that they were sinuate or obtusely lobed as described. In all observable characters it agrees with *M. olivae*. Schultz, in whose herbarium are fragments of Karwinski's plant, described the pales as short and ending in a straight point, which applies well enough to those of *M. olivae* in the flowering state. It would be inadvisable to adopt DeCandolle's name, however, without a further examination of his type.

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[70] Curtis' Bot. Mag. **133**: *pl. 8143.* 1907.

[71] Leopoldina **23**: 91. 1887.

Montagnaea clematidea Walp.,[72] also based on a specimen collected by Karwinski in Mexico, without definite locality, is referred by Schultz Bipontinus [73] to the synonymy of *Montanoa karvinskii*. This reference is supported by Walpers' description, which contains nothing contrary to the characters of the species.

Montanoa quadrangularis Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 407. 1864.

Montagnaea excelsa Ernst, Vargasia **1**: 186. 1870.

Eriocoma moritziana Kuntze, Rev. Gen. Pl. **1**: 336. 1891, nomen nudum.

Montanoa moritziana Schultz Bip.; Dur. & Jacks. Ind. Kew. Suppl. **1**: 282. 1901–06, nomen nudum.

Montanoa quadrangularis was based, as shown by specimens in Schultz's herbarium, on specimens collected by Funck and Schlim (no. 131, Galipan, Prov. Caracas, Venezuela, altitude 1,525 meters, Jan. 1846), Moritz (no. 1386, "in rad. pr. [?] Sierra Nevada, Merida, Columbien, Jan. 1844–45"), and Karsten (Susumuco, Colombia, altitude 1,500 meters). Only the first two, in the order named, were mentioned by Koch in describing the species. *Moritz* 1386, chirotype of the name *moritziana*, was later labeled by Schultz as a variety of *M. quadrangularis*. An authentic specimen of *Montagnaea excelsa* Ernst, described from Galipan, is in the Kew Herbarium with a manuscript description by Ernst. All these plants represent the same species, for which the proper name is *Montanoa quadrangularis* Schultz Bip.

Montanoa triloba Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 406. 1864.

Eriocoma triloba Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

This species, very imperfectly described, was necessarily placed by Robinson and Greenman among the doubtful species in their revision. The type in the Schultz Herbarium (*De Berghes* 123) is a wretched scrap, consisting of a piece of stem with a terminal inflorescence pressed into a cluster of compacted leaves, a detached leaf, and pocket fragments. The original data are not decipherable with certainty, but appear to read "Iapacle [presumably the locality]. Arbol frutali." In spite of its condition, it has been possible to identify it by direct comparison with an excellent specimen in the Kew Herbarium, collected by Galeotti (no. 2374) at Real del Monte, Hidalgo, altitude 1,525 meters, in 1840.

The species is exceedingly close to *Montanoa myriocephala* Robins. & Greenm., and the two may not be separable. The only obvious distinctive character is the somewhat longer involucre of *M. triloba* (4 to 5 mm. in anthesis in *Galeotti* 2374; in *M. myriocephala* 2 to 3.5 mm.). Inasmuch as this feature is one of considerable importance in this immediate group, the two species may for the present be distinguished by its means, although their correspondence in all other features is so close that their identity is probable. It is interesting to note that Dr. Gray long ago suggested [74] that *Palmer* 714 (the type collection of *M. myriocephala*) might be identical with *M. triloba*.

Montanoa xanthiifolia Schultz Bip.; K. Koch, Wochenschr. Gärtn. **7**: 406. 1864.

Eriocoma xanthiifolia Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

Montanoa subglabra Blake, Contr. U. S. Nat. Herb. **22**: 611. 1924.

Comparison of the type collection of *Montanoa xanthiifolia* (*Liebmann* 265, Chacalapa Estate, in Herb. Copenhagen and Schultz Bip.) and the type of *M.*

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[72] *Montagnaea clematidea* Walp. Linnaea **14**: 308. 1840. *Montanoa clematidea* Hemsl. Biol. Centr. Amer. Bot. **2**: 165. 1881. *Eriocoma clematidea* Kuntze, Rev. Gen. Pl. **1**: 336. 1891.

[73] K. Koch, Wochenschr. Gärtn. **7**: 307. 1864.

[74] In S. Wats. Proc. Amer. Acad. **22**: 425. 1887.

subglabra (*E. W. Nelson* 3536, near Neutón, Guatemala) shows that the latter is not separable, differing mainly in its less conspicuously lobed leaves, an inconstant feature. A specimen of this species has also been examined in the herbarium of the British Museum, collected by Barclay (no. 2685) in forest, Sierra de Conchagua, Salvador, in December, 1838. It is described as a shrub 6 feet high, and is the earliest known collection of the species.

In Standley's "Trees and shrubs of Mexico" the writer recorded [75] this species from Costa Rica; the basis of this record is not apparent.

Isocarpha microcephala (DC.) Blake, Proc. Biol. Soc. Washington **39**: 144. 1926.

Dunantia microcephala DC. Prodr. **5**: 627. 1836.

Isocarpha divaricata Benth. Bot. Voy. Sulph. 110. *pl. 41*. 1844.

Isocarpha blepharolepis Greenm. Field Mus. Bot. **2**: 347. 1912.

The type in the Prodromus Herbarium, collected by Haenke, was ascribed to Mexico by DeCandolle but without doubt came from Peru. A duplicate in the Schultz Bipontinus Herbarium, received from Nees in 1854, is also labeled Mexico. The species has been found only in Ecuador and Peru, and the confusion in the labeling of Haenke's plants is well known.

Axiniphyllum scabrum (Zucc.) Blake.

Polymnia scabra Zucc. Abh. Akad. Wiss. München **1**: 313. 1832.

Polymnia aspera Mart.; DC. Prodr. **5**: 515. 1836.

Axiniphyllum tomentosum Benth. in Hook. Icon. Pl. **12**: 17. 1872.

In Martius' herbarium at the Botanic Garden, Brussels, are two specimens of this species, one grown at the Munich garden in 1829, the other in 1832, both from seed collected in Mexico by Keerl. The first is labeled "*Polymnia aspera* Mart. eodem nomine descripsit Zuccarini e seminibus mexicanis Karwinski." There can be no doubt that Martius' reference to the use of the name *Polymnia aspera* by Zuccarini was owing to a slip of memory, and that the latter's *Polymnia scabra* was the name intended. No specimen of Zuccarini's plant has been seen by the writer, but his lengthy description well agrees with *Axiniphyllum tomentosum*. It is probable, moreover, that Martius had other and weightier grounds for identifying the plants than the mere similarity or assumed identity of the names given them by Zuccarini and himself. An excellent but sterile specimen of Martius' plant is in the Prodromus Herbarium, and is probably, as the basis of DeCandolle's description, to be considered the actual type of Martius' species.

Rudbeckia laciniata L. Sp. Pl. 906. 1753.

Tithonia laciniata Raeuschel, Nom. Bot. ed. 3. 251. 1797, nomen nudum.

In 1925 the writer was able to examine at the Kew Herbarium a copy of Raeuschel's rare Nomenclator Botanicus. The name [*Tithonia*] *laciniata* (without authority or synonym) occurs in it, as cited in the Index Kewensis, but it is evident that the combination had its origin in a type-setter's error, and that the specific name *laciniata* was brought up by mistake under *Tithonia* from the following genus, *Rudbeckia*. The habitat "Virginia. Canada" appended to the specific name, the same as given by Linnaeus, makes this certain.

Wulffia maculata (Ker) DC. Prodr. **5**: 563. 1836.

Gymnoloma maculatum Ker, Bot. Reg. **8**: *pl. 662*. 1822.

?*Euxenia radiata* Nees. & Mart. Nov. Act. Acad. Caes. Leop. Carol. Nat. Cur. **12**: 7. 1824.

?*Gymnopsis? euxenioides* DC. Prodr. **5**: 562. 1836.

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[75] Contr. U. S. Nat. Herb. **23**: 1532. 1926.

Euxenia radiata Nees & Mart., doubtfully transferred to *Gymnopsis* under a new name by DeCandolle on the basis of the original description, and omitted from the Flora Brasiliensis, is represented in the Schultz Bipontinus Herbarium by an authentic specimen received from Nees and labelled "Brasilia Pr. Max. d. Nees 1854." It agrees well with an authentic specimen of *Wulffia salzmanni* DC. in the same herbarium. The latter is referred by O. E. Schulz [76] to *Wulffia maculata* (Ker) DC., which Schulz considers closely related to the commoner and more northern species, *W. baccata* (L. f.) Kuntze, but distinct. The distinctive characters relied upon by Schulz to separate *W. maculata* are not apparent in the specimen of Nees and Martius' species, and the writer is doubtful whether it should not be referred to *W. baccata* (L. f.) Kuntze, which Schulz does not admit in Brazil.

Iostephane heterophylla (Cav.) Benth.; Hemsl. Biol. Centr. Amer. Bot. **2**: 168. 1881.

Coreopsis heterophylla Cav. Icon. Pl. **3**: 34. *pl. 268.* 1795.

Rudbeckia napifolia H. B. K. Nov. Gen. & Sp. **4**: 244. 1820.

Echinacea dicksoni Lindl. Bot. Reg. **24**: *pl. 27.* 1838.

The type of *Rudbeckia napifolia* H. B. K. in the Paris Herbarium, collected near Santa Rosa de la Sierra, Guanajuato, altitude about 2,280 meters, is *Iostephane heterophylla.* No specimen of *Echinacea dicksoni* Lindl. has been seen, but the description and plate leave no doubt as to its identity. The species was described by Lindley from specimens grown in the garden of the Horticultural Society from seed from the *tierra fria* of Mexico, presented by G. F. Dickson. Both names are omitted from the Botany of the Biologia Centrali-Americana.

Sabazia humilis (H. B. K.) Cass. Dict. Sci. Nat. **46**: 481. 1827.

Eclipta humilis H. B. K. Nov. Gen. & Sp. **4**: 264. *pl. 394.* 1820.

Aganippea dentata DC. Prodr. **6**: 3. 1837.

The genus *Aganippea* DC. was based on two species, *A. bellidiflora,* which is to be taken as type, and *A. dentata,* both being described as new. No new species have since been described and neither of the original ones has been removed. DeCandolle's second species, *A. dentata,* based on *Berlandier* 901, collected near the City of Mexico, proves to be a synonym of *Sabazia humilis* (H. B. K.) Cass., so that the genus is properly a monotypic one.

Zaluzania cinerascens Schultz Bip. Flora **47**: 219. 1864.

Zaluzania coulteri Hemsl. Biol. Centr. Amer. Bot. **2**: 159. *pl. 46.* 1881.

Gymnolomia cinerascens Benth. & Hook.; Hemsl. Biol. Centr. Amer. Bot. **2**: 161. 1881.

Zaluzania cinerascens Schultz Bip. was not mentioned in Robinson and Greenman's revision [77] of the genus, having been treated by them [78] as a species of *Gymnolomia* on the basis of Bentham and Hooker's disposition of it. The type, *Ehrenberg* 346 in the Schultz Herbarium, from Mineral del Monte (=Real del Monte, Hidalgo), is identical with the type of *Z. coulteri* Hemsl., *Coulter* 350 from the same locality, in the Kew Herbarium. Bentham and Hooker referred the species to *Gymnolomia* on the basis of Schultz's description of the rays as neutral. So they are, not only in Schultz's type, but also in a head of Hemsley's dissected by the writer (although figured by Hemsley as pistillate), and in *Pringle* 7923. In *Pringle* 6956, 9997, and 13784 the rays bear styles about equaling the tube of the corolla and very shortly and unequally 2-parted, and the embryos are abortive.

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[76] In Urban, Symb. Antill. **7**: 93. 1911.

[77] Proc. Amer. Acad. **34**: 530. 1899.

[78] Proc. Bost. Soc. Nat. Hist. **29**: 90. 1899.

The species is thus not typical of *Zaluzania*, not having the fertile rays of that genus; but it agrees in all other essentials, including the short bluntish style tips, and is best retained in the genus.

Wedelia brasiliensis (Spreng.) Blake.

Buphthalmum strigosum Spreng. Neu. Entd. **2**: 140. 1821. Not *Wedelia strigosa* Hook. & Arn. 1840–41.

Acmella brasiliensis Spreng. Syst. Veg. **3**: 592. 1826.

Buphthalmum heterophyllum Willd.; Spreng. Syst. Veg. **3**: 592. 1826, as synonym.

Wedelia pedunculosa DC. Prodr. **5**: 485. 1836, sphalm.

Wedelia paludosa DC. Prodr. **5**: 538. 1836.

The type of *Acmella brasiliensis* Spreng. in the Schultz Bipontinus Herbarium belongs to the Brazilian species, closely related to *W. trilobata* (L.) Hitchc., which for nearly a century has been known as *Wedelia paludosa* DC. The earlier name, *Buphthalmum strigosum* Spreng., equated with *A. brasiliensis* by Sprengel himself, is unavailable for use, owing to the existence of *W. strigosa* Hook. & Arn. In the Prodromus, in the list of excluded species of *Buphthalmum*, *B. strigosum* was referred to "*Wedelia pedunculosa*?," the latter name being obviously a clerical error for *W. paludosa*. Under var. *latifolia* of the latter species De Candolle remarks: "Huc forte pertinet Acmella Brasiliensis Spreng. syst 3. p. 592, sive Buphthalmum strigosum Spreng. neu. entd. 2. p. 140, sed nihil asserere queo cum Acmella Spreng. septem speciebus ad septem genera diversa referendis constet." In his revision of *Spilanthes*, A. H. Moore [79] incorrectly refers *B. strigosum*, *A. brasiliensis*, and *B. heterophyllum* to the synonymy of *Spilanthes oleracea* L., evidently by confusion with *Spilanthes brasiliensis* Spreng. (properly so referred), a name published quite independently of *Acmella brasiliensis*.

In the type of *Acmella brasiliensis* in Sprengel's herbarium, collected in Brazil by Sellow, the largest leaf is oblong-lanceolate, about 5 cm. long and 1.8 cm. wide, and bears a small tooth on each side near the middle.

Wedelia brasiliensis (*W. paludosa*) is certainly very closely related to the common *W. trilobata* (L.) Hitchc. (*W. carnosa* L. Rich.), but appears separable on the basis of the rather scanty material examined. O. E. Schulz,[80] in his monograph of the West Indian species of *Wedelia*, considers it distinct and assigns to it a range from Brazil to Central America. The writer has seen no specimens certainly referable to it from outside Brazil. DeCandolle's var. *latifolia* of *W. paludosa*, of which the types from Bahia (*Blanchet* 19, 74, and *Lhostky*) have been examined, seems better referred to *W. trilobata* (L.) Hitchc., which is not generally recognized from Brazil. The U. S. National Herbarium possesses a sheet collected at Bahia in 1887 by L. A. Lee on the cruise of the "Albatross" which is not distinguishable from ordinary Central American or West Indian specimens of *W. trilobata*. Thus it seems likely that this species extends around the coast of eastern South America from the Guianas, where it is common, to Bahia.

Wedelia glauca (Orteg.) O. Hoffm.; Hicken, Chlor. Plat. Argent. (Apuntes Hist. Nat. **2**:) 254. 1910.

Pascalia glauca Orteg. Hort. Matr. Dec. 39. *pl. 4*. 1797.

Leighia ? ecliptaefolia DC. Prodr. **5**: 583. 1836.

Lorentzia pascalioides Griseb. Abh. Ges. Wiss. Göttingen **19**: 182. 1874.

Aspilia ? ecliptaefolia Baker in Mart. Fl. Bras. **6**[3]: 197. 1884.

The type of *Leighia ? ecliptaefolia* DC. in the Paris Herbarium (*Herb. Imp. Bras.* 882) is *Wedelia glauca*. It is represented also by scraps in the Prodromus

[79] Proc. Amer. Acad. **42**: 530. 1907.

[80] In Urban, Symb. Antill. **7**: 99. 1911.

Herbarium. Baker's transfer of the species to *Aspilia* was based on assumption only, no specimen having been examined. The invalidity of the generally maintained genus *Pascalia* has been shown by the writer.[81]

Wedelia subvaginata N. E. Brown, Trans. Bot. Soc. Edinburgh **20**: 61. 1894.

Wedelia crassiuscula Blake, Contr. Gray Herb. **52**: 38. 1917.

Examination of the type of *Wedelia subvaginata* N. E. Brown in the Kew Herbarium, collected by J. Graham Kerr on the Rio Pilcomayo in the Gran Chaco, has shown its identity with *W. crassiuscula* Blake, based on *Hassler* 2741 (type in British Museum) from Santa Elisa, Gran Chaco, Paraguay, lat. S. 23° 10′.

Wedelia trilobata (L.) Hitchc. Ann. Rep. Mo. Bot. Gard. **4**: 99. 1893.

Silphium trilobatum L. Syst. Nat. ed. 10. **2**: 1233. 1759.

Verbesina tridentata Spreng. Syst. Veg. **3**: 577. 1826.

Sprengel's *Verbesina tridentata* is retained by De Candolle as a doubtful species, and by Robinson and Greenman[82] is referred to *Aspilia buphthalmiflora* (DC.) Griseb., apparently through confusion with *V. montevidensis* Spreng., which is so referred by Baker. Sprengel's type in the Schultz Bipontinus Herbarium is an ordinary specimen of *Wedelia trilobata* (L.) Hitchc. The specimen bears no data. In the original description the habitat given was "Martinica. Amer. austr.," the "Amer. austr." being apparently based on the synonym "*V. fruticosa* W. excl. syn. L." cited by Sprengel. Willdenow[83] listed several synonyms under his *Verbesina fruticosa*, the one excluded by Sprengel representing as to type *Zexmenia frutescens* (Mill.) Blake, the others, as well as his description, relating to *Narvalina domingensis* (Cass.) Less. The identity of Willdenow's plant, however, is of no great importance, since Sprengel's name must be typified by the specimen, presumably from Martinique, in his herbarium.

Aspilia kunthiana (Gardn.) Blake.

Gymnopsis kunthiana Gardn. Lond. Journ. Bot. **7**: 292. 1848.

Gymnolomia kunthiana Baker in Mart. Fl. Bras. **6**[3]: 172. 1884.

Copious material of *Gardner* 3846, the type collection, from near Conceiçâo, Goyaz, Brazil, has been examined in the Kew Herbarium, the British Museum, and the herbarium of Schultz Bipontinus, and a photograph and fragments are now in the U. S. National Herbarium. The species has hitherto passed as the only Brazilian representative of *Gymnolomia* H. B. K., a genus which as to its type is to be reduced to *Aspilia*,[84] although most of the numerous species that have been referred to it belong to *Viguiera*, *Tithonia*, and *Hymenostephium*.

Gymnopsis kunthiana Gardn. is an *Aspilia*, with neutral rays and pappus reduced to a minute denticulate crown. It is clearly distinct from any of the species described under *Aspilia* in the Flora Brasiliensis.

Aspilia montevidensis (Spreng.) Kuntze, Rev. Gen. Pl. **3**[2]: 129. 1898.

Verbesina montevidensis Spreng. Syst. Veg. **3**: 578. 1826.

Leighia buphthalmiflora DC. Prodr. **5**: 582. 1836.

Leighia debilis Nutt. Trans. Amer. Phil. Soc. n. ser. **7**: 365, footnote. 1841.

Aspilia buphthalmiflora Griseb. Abh. Ges. Wiss. Göttingen **19**: 183. 1874.

Examination of the types of *Verbesina montevidensis* Spreng. (Montevideo, *Sellow*, in the Schultz Bipontinus Herbarium) and *Leighia debilis* Nutt. (Mal-

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[81] Contr. Gray Herb. **52**: 39. 1917.

[82] Proc. Amer. Acad. **34**: 566. 1899.

[83] Sp. Pl. **3**: 2227. 1803.

[84] Blake, Contr. Gray Herb. **54**: 13–19. 1918; Contr. U. S. Nat. Herb. **22**: 619. 1924.

donado, Uruguay, *Baldwin*, in the British Museum) shows that both are referable to the species generally known as *Aspilia buphthalmiflora* (DC.) Griseb. This must now take the name *Aspilia montevidensis* (Spreng.) Kuntze.

Aspilia wedelioides (DC.) Blake.

Gymnopsis wedelioides DC. Prodr. **5**: 562. 1836.

The type of *Gymnopsis wedelioides* DC. in the Prodromus Herbarium ("Antilles," collector not given) represents a species of *Aspilia* related to *A. verbesinoides* (DC.) Blake and *A. nigropunctata* Blake, but apparently distinct from either. The locality given in the Prodromus is "in ins. Caribaeis, forte in Tobago (h. L'Her.)." The species is apparently a local one which has not again been collected.

Viguiera cornifolia (H. B. K.) Blake, Contr. Gray Herb. **54**: 184. 1918.

Helianthus cornifolius H. B. K. Nov. Gen. & Sp. **4**: 223. 1820.

Leighia urticiformis DC. Prodr. **5**: 582. 1836.

Viguiera urticiformis Hemsl. Biol. Centr. Amer. Bot. **2**: 179. 1881.

The type specimen of *Helianthus cornifolius* in the Humboldt and Bonpland Herbarium at Paris is in poor condition, but a better specimen of the same collection (*Bonpland* 4237) in the general herbarium at Paris shows that the species is identical with the later *Leighia urticiformis* DC., the type of which has been examined in the Prodromus Herbarium. In the writer's revision of the genus, *V. cornifolia* was placed among the doubtful species, its true identity not having been recognized.

Viguiera dentata helianthoides (H. B. K.) Blake, Contr. Gray Herb. **54**: 86. 1918.

Viguiera helianthoides H. B. K. Nov. Gen. & Sp. **4**: 226. *pl. 379.* 1820.

Rudbekia (sic) canescens Poepp.; Spreng. Syst. Veg. **3**: 612. 1826.

The type of *Rudbekia canescens* Poepp. in the Schultz Bipontinus Herbarium (no. 1798 in herb. Sprengel) is *Viguiera dentata* var. *helianthoides*. It is labeled "Rudbekia canescens En. pl. Cub. MSS. Ad vias Cubae. Jan." The name is omitted from the Index Kewensis and from DeCandolle's Prodromus.

Viguiera incana (Pers.) Blake.

Helianthus incanus Pers. Syn. Pl. **2**: 475. 1807.

Helianthus canescens Juss.; Pers. Syn. Pl. **2**: 475. 1807, as synonym.

Helianthus aureus H. B. K. Nov. Gen. & Sp. **4**: 224. 1820.

Harpalium aureum Cass. Dict. Sci. Nat. **25**: 438. 1822.

Viguiera aurea Hieron. Bot. Jahrb. Engler **28**: 608. 1901.

Helianthus incanus Pers., briefly described from "R. Peruviano" with the cited synonym "*H. canescens*. Herb. Juss.," has remained unidentified. It is represented in the Jussieu Herbarium at Paris by an excellent specimen (no. 9443) labeled "Helianthus canescens Vahl mss. Perou - Jos. de Jussieu." Although said to be from Peru,[85] it is a typical example of the species generally known as *Viguiera aurea* (H. B. K.) Hieron., which is known only from Ecuador, and is now represented in the U. S. National Herbarium by a good series of specimens. There is also a sheet of the same species in the general collecton of the Paris Herbarium labeled "Helianthus canescens Vahl mss. Sic in herb. Juss. Helianthus incanus Pers. Perou. Dombey." Whether Persoon examined the specimen now in the Jussieu Herbarium or whether he had a duplicate of it seems now impossible to determine, but its entire correspondence with his description leaves no room for doubt that it may be taken as authentic for his species, and that his name must be adopted.

[85] Ecuador formed a part of Peru until 1822. Joseph de Jussieu accompanied Bouguer and La Condamine on their expedition of 1735, which landed at Quito, and he remained in South America until 1771, traveling and collecting extensively.

Viguiera peruviana A. Gray, Proc. Amer. Acad. **5**: 124. 1861.

Helianthus rugosus Meyen, Reis. Erd. **2**: 45. 1835. Not *Viguiera rugosus* [sic] (Schauer) Benth. & Hook. 1881.

A photograph and tiny fragments of Meyen's type are in the Gray Herbarium, obtained by the writer in 1914 at the Berlin Herbarium. The type is a small and poorly developed, uncharacteristic specimen, but evidently belongs to *Viguiera peruviana*. The young achenes and pappus (of 2 awns and a pair of small lacerate squamellae at the base of each awn) are quite those of *V. peruviana*, and the other characters agree well enough. The following additional specimens have been studied in a loan from the Kew Herbarium:

PERU: Quebrada de la Cuesta, on way from Arequipa to Islay, Sept. 1854, *Lechler* 2760. "Cobija, Iquiqui, et Arica," *Cuming* 941 (2 sheets).

The leaves on the branchlets are often opposite. Lechler's plant was distributed as *Helianthus rugosus*. Meyen's type came from the coast cordillera back of Islay, and Gray's from the Andes between Culluay and Obrajillo.

Viguiera procumbens (Pers.) Blake.

Sanvitalia helianthoides L. Rich.; Willd. Sp. Pl. **3**: 2190. 1803. Not *Viguiera helianthoides* H. B. K. 1820.

Helianthus procumbens Pers. Syn. Pl. **2**: 475. 1807.

Helianthus prostratus (*prostratum*) Hort. Paris.; Pers. Syn. Pl. **2**: 475. 1807, as synonym. Not *H. prostratus* Willd. 1803.

Viguiera pflanzii Perkins, Bot. Jahrb. Engler **49**: 226. 1913.

Sanvitalia helianthoides L. Richard is represented by two sheets of good specimens in the Cosson Herbarium at Paris, from the DeFranqueville Herbarium. They are labeled simply "Perou." In the Jussieu Herbarium is a sheet (no. 9445) bearing two garden specimens of the same species, collected respectively in 1788 and 1791, and labeled "Helianthus. Perou. Domb. Helianthus procumbens Persoon. Enchir. Will. Syn. H. prostratus Poir. Encyl. Suppl. Desf." In the general herbarium at Paris is another sheet labeled by Desfontaines "Helianthus prostratus Persoon," and by Spach "Ex horto Par.?" All these specimens belong to the somewhat variable species called *Viguiera pflanzii* Perkins in the writer's revision of the genus,[86] and may safely be taken as authenticating the names *Sanvitalia helianthoides* L. Rich., *Helianthus procumbens* Pers., and *H. prostratus* Hort. Par. (not Willd. 1803, a North American species of doubtful status). Persoon's name is the earliest available for use, and must be taken up for the species. Two sheets under *H. procumbens* Pers. in the Prodromus Herbarium, one labeled "Helianthus. Peru. Pavon," the other "Helianthus prostratus Cav. 22 fructidor an 8," represent the same species, considerably modified by cultivation.

Helianthus annuus L. Sp. Pl. 904. 1753.

Helianthus cirrhoides Lehm. Hamb. Gart. Zeit. **8**: 458. 1852.

The identity of *Helianthus cirrhoides* Lehm. does not appear to have been recorded. It is represented in the Schultz Bipontinus Herbarium by five sheets of authentic material received from Lehmann. The specimens, which agree perfectly with Lehmann's description, represent a coarse cultivated state of *Helianthus annuus* with unusually long caudate-cirrhate tips to the phyllaries. The rays were described by Lehmann as pale, the disk flowers as greenish. The description was drawn up from specimens grown at the Hamburg Botanical Garden from seed received under the name *Helianthus patens* Lehm. from the Utrecht Garden.

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[86] Contr. Gray Herb. **54**: 142. 1918.

Melanthera discoidea (Baker) Blake.

Echinocephalum discoideum Baker in Mart. Fl. Bras. 6[3]: 230. 1884.

Amellus discodeus (sic) Kuntze, Rev. Gen. Pl. 1: 306. 1891.

The writer did not find either at Kew or at Brussels any specimens of this species, based by Baker on material collected by Martius at Porto das Miranhas in the Rio Negro region, Province Alto Amazonas, Brazil. No species of the genus *Melanthera* was listed by Baker from Brazil, but *E. discoideum*, from description, evidently belongs to it. It is curious that Baker, after distinguishing *Echinocephalum* from *Melanthera* by its possession of sterile rays (the latter being discoid), should immediately proceed to describe under it this discoid species. The exact relationships of the species must remain in doubt until authentic material can be examined.

Spilanthes iodiscaea A. H. Moore, Proc. Amer. Acad. **42**: 536. 1907.

Verbesina pusilla Poir. in Lam. Encycl. **8**: 459. 1808.

Eclipta ? pusilla DC. Prodr. **5**: 491. 1836.

The type of *Verbesina pusilla* Poir. in the herbarium of the Muséum d'Histoire Naturelle, collected in Porto Rico, is identical with *Spilanthes iodiscaea* A. H. Moore. Poiret's name can not be taken up for this species owing to the existence of *Spilanthes pusilla* Hook. & Arn.,[87] a valid species of Argentina.

Zexmenia macrocephala (Hook. & Arn.) Hemsl. Biol. Centr. Amer. Bot. **2**: 173. 1881.

Lipochaeta macrocephala Hook. & Arn. Bot. Beechey Voy. 436. 1840–41.

Zexmenia ghiesbreghtii A. Gray, Pl. Wright. 1: 113, footnote. 1852, as *Z. ghiesbrechtii*.

Zexmenia macrocephala (Hook. & Arn.) Hemsl. has remained a doubtful species since its description, and no specimens except the original ones appear ever to have been assigned to it. There are two original specimens in the Kew Herbarium, both from Acapulco, one from the Hooker Herbarium, labeled as collected by Sinclair, the other, from the Bentham Herbarium, marked as collected by Hinds. Although somewhat different in habit and evidently derived from two different plants, they are conspecific and are identical in all essential characters with *Zexmenia ghiesbreghtii* A. Gray, which also has been collected at Acapulco. In W. W. Jones' revision [88] of *Zexmenia* both *Z. ghiesbreghtii* and *Z. macrocephala* were retained as distinct species, placed together, and distinguished by characters of no real consequence. The material from Kew on which Jones' notes were based was taken from the specimen in the Bentham Herbarium, which is less typical in appearance of *Z. ghiesbreghtii* than the other specimen (in the Hooker Herbarium). The latter is evidently the type, as the original description says "a solitary specimen of this is in the collection." Although the type locality is given as "between San Blas and Tepic," there is every reason to suppose that the specimen in the Hooker Herbarium mentioned above is the one referred to, particularly since Hemsley gives the locality as Acapulco. The description, in any case, applies definitely to the plant generally known as *Zexmenia ghiesbreghtii*.

In Jones' revision of *Zexmenia*, *Z. greggii* A. Gray and *Z. ghiesbreghtii* are placed some distance apart (nos. 6 and 14) through the use of the length of the squamellae as a principal key character. Although this character is often of importance in the genus, it shows considerable variability in the same species, and the extent to which it separates these two very closely allied species is evidence of its general unsatisfactory nature. In *Z. macrocephala* (*Z. ghiesbreghtii*), for instance, the squamellae, though usually minute, as described by Jones, not infrequently reach a length of 1 mm., which in his key would place

[87] In Journ. Bot. Hook. **3**: 317. 1841.

[88] Proc. Amer. Acad. **41**: 152. 1905.

them in *Z. greggii*. In achenes from the type of *Lipochaeta macrocephala* they reach 1.8 mm. A much better distinctive character is afforded by the phyllaries. In *Z. macrocephala* the outer ones are suborbicular-ovate, blunt or rounded at tip; in *Z. greggii* they are triangular or triangular-ovate and acuminate.

Zexmenia serrata Llave in Llave & Lex. Nov. Veg. Descr. **1**: 13. 1824.
Zexmenia scandens Hemsl. Biol. Centr. Amer. Bot. **2**: 174. 1881.
Zexmenia trachylepis Hemsl. Biol. Centr. Amer. Bot. **2**: 175. 1881.
Zexmenia dulcis Coulter, Bot. Gaz. **16**: 99. 1891.
Verbesina sylvicola T. S. Brandeg. Univ. Calif. Publ. Bot. **10**: 419. 1924.

The identity of *Zexmenia serrata* Llave, the type species of the genus, has never been determined. There are in the Delessert Herbarium three sheets labeled with this name. One is *Zexmenia scandens* Hemsl., and has two labels—"Zexmenia serrata Llave" and "Mexico. Herb: La Llave." The other two are *Z. ceanothifolia* (Willd.) Schultz Bip., and are labeled "Mexico. Cervantes" in a handwriting quite different from that on the sheet of *Z. scandens*. In view of the definite label of the latter, and its excellent correspondence with the original description, there seem to be no reasonable grounds for doubt that it is authentic for Llave's species, and that the identity of this, the type species of the genus *Zexmenia*, has at last been ascertained.

Zexmenia verbenaefolia (DC.) Blake.
Calea verbenaefolia DC. Prodr. **5**: 673. 1836.
Lipochaeta umbellata β. conferta DC. Prodr. **5**: 610. 1836.
Zexmenia microcephala Hemsl. Biol. Centr. Amer. Bot. **2**: 173. 1881.
Zexmenia ceanothifolia var. *conferta* A. Gray; W. W. Jones, Proc. Amer. Acad. **41**: 155. 1905.

Examination of the types of *Calea verbenaefolia* DC. (*Née*, without locality), *Lipochaeta umbellata β. conferta* DC. (*Berlandier* 1053, Cuernavaca), and *Zexmenia microcephala* Hemsl. (*Sinclair*, San Blas to Tepic) has shown that they represent one species, for which the earliest specific name is *Calea verbenaefolia*. DeCandolle's type of this species is an excellent match for *Lamb* 519, from Acaponeta, Tepic, but has even shorter pedicels (mostly 1.5 to 5 mm. long). In fragments obtained from Hemsley's type of *Z. microcephala* the squamellae are not absent, as described by Hemsley and W. W. Jones, but at least sometimes are present (about 1 on each side of achene) and as much as 1.3 mm. long.

Otopappus imbricatus (Schultz Bip.) Blake.
Zexmenia imbricata Schultz Bip. in Seem. Bot. Voy. Herald 306. 1856.
Otopappus epaleaceus var. (?) *pringlei* Greenm. Proc. Amer. Acad. **40**: 42. 1904.
Otopappus pringlei Blake, Journ. Bot. Brit. & For. **53**: 232. 1915.

Schultz's type, a specimen collected by Haenke in Mexico without definite locality, has been available for study through the kindness of Prof. H. Lecomte.

Verbesina eggersii Hieron. Bot. Jahrb. Engler **28**: 611. 1901.
Silphium platypterum Spruce; Benth. & Hook. Gen. Pl. **2**: 350. 1873, nomen nudum.
Verbesina platyptera Benth. & Hook.; Hook. & Jacks. Ind. Kew. 2^2: 1181. 1895, nomen nudum. Not *Verbesina platyptera* Schultz Bip.; Klatt, Leopoldina **23**: 144. 1887.

Silphium platypterum Spruce, a name never published with description, was based on *Spruce* 6472 from near Chanduy, Ecuador. Through the kindness of Dr. A. W. Hill, the excellent specimen in the Kew Herbarium was lent the writer for study some time ago. It proves to be identical with *Verbesina eggersii* Hieron., based on *Eggers* 14941 from Hacienda El Recreo, Province Manabi, Ecuador (fragments of type in the U. S. National Herbarium). *Eggers* 15687

(U. S. National Herbarium), from the same locality as the type, is referable to this species also.

Verbesina elegans H. B. K. Nov. Gen. & Sp. **4**: 204. 1820.

Verbesina arthurii Blake, Contr. Gray Herb. **53**: 26. 1918.

Examination of the type of *Verbesina elegans* H. B. K., from "Regno Quitensi?", in the Paris Herbarium, has shown its identity with *V. arthurii* Blake, based on *Apollinaire & Arthur* 60, from Guadalupe, Colombia. In Robinson and Greenman's revision of the genus, *V. elegans* is wrongly placed in the section *Verbesinaria* under a group characterized in part by having "leaves canescent-tomentose beneath." In the type and other specimens of *V. elegans* the leaves are, as described by Humboldt, Bonpland, and Kunth, merely hirtous or hirsute and green beneath, and the species is better placed in the section *Saubinetia*, next to *V. sordescens* DC.

Verbesina humboldtii Spreng. Syst. Veg. **3**: 577. 1826.

Verbesina helianthoides H. B. K. Nov. Gen. & Sp. **4**: 204. 1820. Not *Verbesina helianthoides* Michx. 1803.

Verbesina lehmannii Hieron. Bot. Jahrb. Engler **28**: 612. 1901.

The identity of *Verbesina lehmannii* Hieron. with *V. humboldtii* Spreng., long a doubtful species of the genus, has been noted and discussed by the writer.[89] The species appears to be best referred to the section *Saubinetia*.

Verbesina lindenii (Schultz Bip.) Blake.

Silphium arborescens Mill. Gard. Dict. ed. 8. *Silphium* no. 4. 1768.

Zexmenia lindenii Schultz Bip. in Seem. Bot. Voy. Herald 306. 1856.

Lasianthaea lindenii Schultz Bip. in Seem. Bot. Voy. Herald 306. 1856, as synonym.

Verbesina olivacea Klatt, Leopoldina **20**: 93. 1884.

Otopappus olivaceus Klatt, Ann. Naturhist. Hofmus. Wien **9**: 362. 1894.

Verbesina arborescens Blake, Journ. Bot. Brit. & For. **53**: 57. 1915. Not *V. arborescens* (L.) Gomez, 1890.

Zexmenia lindenii Schultz Bip., based on *Linden* 1157 (from Mirador, Veracruz, altitude 3,000 ft., Oct. 1838, in the Schultz Herbarium) has remained a doubtful species since its description. The type specimen is referable to the species usually known as *Verbesina olivacea* Klatt, and Schultz's name must be taken up.

Verbesina parviflora (H. B. K.) Blake, Proc. Biol. Soc. Washington **39**: 144. 1926.

Helianthus parviflorus H. B. K. Nov. Gen. & Sp. **4**: 222. *pl. 378*. 1820.

Actinomeris stricta Hemsl. Biol. Centr. Amer. Bot. **2**: 186. 1881.

Verbesina stricta A. Gray, Proc. Amer. Acad. **19**: 13. 1883.

Despite the fact that it was represented by a plate, *Helianthus parviflorus* H. B. K. remained of uncertain identity until examination of the type by the writer in 1925 showed it to be identical with the rather common Mexican plant known as *Verbesina stricta* (Hemsl.) A. Gray. The type is a specimen which, after an injury to the main axis, has thrown out a couple of long 1-headed flowering branches. It was collected at "Santa Rosa Mexicanorum," which lies in Querétaro or Guanajuato.

Verbesina tetraptera (Orteg.) A. Gray, Proc. Amer. Acad. **19**: 13. 1883.

Coreopsis alata ("*allata*") Cav. Icon. Pl. **3**: 30. *pl. 260*. 1795. Not *Verbesina alata* L. 1753.

Helianthus tetrapterus Orteg. Hort. Matr. Dec. 74. 1798.

Verbesina scabra Benth. Pl. Hartw. 41. 1840.

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[89] Journ. Washington Acad. Sci. **16**: 226. 1926.

In Robinson and Greenman's revision[90] of *Verbesina*, *Verbesina scabra* Benth., which had been synonymized with *V. tetraptera* (or *Actinomeris tetraptera*) by Hemsley and Gray, was restored to independent standing on the basis of the original description and of a drawing by Klatt, and *Palmer* 377 (Jalisco, 1886) was referred to it. After examining Bentham's type (*Hartweg* 315, from Zitaquaro, Michoacán, in the Kew Herbarium), I find it impossible to distinguish it in any way from the ordinary form of *V. tetraptera*. The species is variable in the character of its involucre, as well as in leaf pubescence, but the differences do not seem to be of taxonomic value. *Palmer* 377 has a different involucre, partly or in some cases wholly wingless peduncles, and elliptic-oblong or obovate-oblong leaves which show no tendency toward the rhombic or deltoid and usually hastate type characteristic of *V. tetraptera*. It may represent a distinct species.

Verbesina tomentosa DC. Prodr. **5**: 614. 1836.

Verbesina hastifolia Blake, Bull. Torrey Club **51**: 426. 1924.

DeCandolle's *Verbesina tomentosa*, described from a fruiting specimen collected by Née, supposedly in South America, has remained dubious. It was doubtfully referred by Robinson and Greenman,[91] in their revision of the genus, to *V. sublobata* Benth., their action probably being based on Klatt's unfounded remarks[92] on the same point. Study of the writer's photograph and notes of the type specimen in the Prodromus Herbarium leave little doubt that it is identical with *Verbesina hastifolia* Blake, described from specimens collected by Macbride and Featherstone (no. 195) at Matucana, Department of Lima, Peru, in 1922. The species has since been collected by Pennell (no. 14441) along the Río Chillón, near Viscas, Department of Lima, Peru, altitude 2,000 to 2,300 meters, the specimen (Field Museum) representing a less densely pubescent form with the leaves at length merely pilosulous beneath.

Verbesina turbacensis H. B. K. Nov. Gen. & Sp. **4**: 203. 1820.

Verbesina pinnata Clark.; DC. Prodr. **5**: 615. 1836.

Verbesina pinnata was described by DeCandolle from the sterile leafy stem tip of a specimen of unknown origin, now in the Prodromus Herbarium, supplemented by notes on the inflorescence and flowers evidently derived from manuscript notes of L'Héritier. It has never been recognized with certainty among subsequent collections. Even the identity of its author (whose name is given by DeCandolle as "Clark.," as though it were an abbreviation for Clarke or Clarkson) is not obvious. The type specimen agrees so well, in all evident characters except its sometimes more numerous leaf-lobes (3 to 5 pairs), with such specimens of *Verbesina turbacensis* with deeply lobed leaves as *Heyde & Lux* (distr. *J. D. Smith*) 6178, *C. L. Smith* 313, and *Pringle* 4966, that there seems no reason for longer attempting to maintain it as a separate species.

The writer was not able to find a type specimen of *V. turbacensis* at the Paris Herbarium.

Calyptocarpus vialis Less. Syn. Gen. Comp. 221. 1832.

Calyptocarpus wendlandii Schultz Bip. Bot. Zeit. **24**: 165. 1866.

Wendland 1078, from San José, Costa Rica, July 17, 1851, the type of Schultz's species in the Schultz Herbarium, is a normal specimen of *C. vialis*, as is another specimen referred to the same species in the same herbarium, collected by Dr. Scherzer in the region of San José, at an altitude of 2,440 meters, in 1853. The generic name has been persistently emended to *Calyptrocarpus* by authors as though from *καλύπτρα, a veil*, but is evidently derived from *καλυπτός, covered*

[90] Proc. Amer. Acad. **34**: 538. 1899.

[91] Proc. Amer. Acad. **34**: 566. 1899.

[92] Leopoldina **20**: 93. 1884.

(referring to the "corticate" achene), and should be retained as originally written by Lessing, who used the same spelling a few years later.[93]

Calea angusta Blake, nom. nov.

Galinsogea angustifolia Spreng. Neu. Entd. **2**: 138. 1821.

Ageratum angustifolium Spreng. Syst. Veg. **3**: 446. 1826.

Trichophyllum angustifolium Less. Linnaea **6**: 519. 1831.

Bahia angustifolia DC. Prodr. **5**: 656. 1836.

Calea angustifolia Schultz Bip.; Baker in Mart. Fl. Bras. **6**[3]: 256. 1884. Not *Calea angustifolia* Gardn. Lond. Journ. Bot. **7**: 417. 1848.

The types of *Galinsogea angustifolia* and *Ageratum angustifolium*, described as independent species by Sprengel, are preserved in the Schultz Bipontinus Herbarium. Lessing's and DeCandolle's transfers were based on the latter name. The species requires a new name, owing to the publication by Gardner of another *Calea angustifolia*, retained by Baker as a variety of *C. multiplinervia*.

Calea coriacea DC. Prodr. **5**: 675. 1836.

Calea robusta Britton, Bull. Torrey Club **19**: 151. 1892.

The identity of these two species is shown by a comparison of DeCandolle's type, collected in "Peruvia" by Haenke, with *Bang* 1423, from Bolivia, which is *C. robusta* Britton. The species has been known definitely only from Bolivia (region of Yungas, and elsewhere). Haenke is known [94] to have visited Cochabamba, Bolivia, and undoubtedly collected this specimen on that trip.

Calea liebmannii Schultz Bip.; Klatt, Leopoldina **23**: 145. 1887.

Calea leptocephala Blake, Contr. U. S. Nat. Herb. **22**: 646. 1924.

In their revision of the Central American species of *Calea*, *Calea liebmannii* was doubtfully placed by Robinson and Greenman [95] in the *Calydermos* group on the basis of Klatt's inadequate and in some respects incorrect description, and was passed over by the present writer at the time *C. leptocephala* was published from Tonameca, Oaxaca (type *Reko* 3544). Examination of the excellent specimens of the type collection (*Liebmann* 411, from Gualulu, Mexico) in Schultz's herbarium has shown its identity with the latter.

Calea sessiliflora Less. Linnaea **5**: 158. 1830.

Calea brevipes Blake, Contr. U. S. Nat. Herb. **22**: 647. 1924.

Lessing's *Calea sessiliflora*, which has remained an unrecognized species, was very briefly described on the basis of material said to have been collected in Mexico by Humboldt, and preserved in Willdenow's herbarium (no. 15241), where it was labeled *Chrysosphaerium gnaphalioides*. Scraps of the same plant, apparently from Willdenow's herbarium, have been examined by the writer in the Schultz Bipontinus Herbarium. It is not one of the Mexican species, but agrees perfectly, so far as the material goes, with the plant recently described by the writer as *Calea brevipes* from the Department of Tolima, Colombia (*Pennell* 3463, type). This region was visited by Humboldt and Bonpland and the specimen in the Willdenow Herbarium was undoubtedly collected there by them, although for some reason it remained undescribed in their work.

Calea zacatechichi Schlecht. Linnaea **9**: 589. 1834.

Aschenbornia heteropoda Schauer, Linnaea **19**: 716. 1847.

The monotypic genus *Aschenbornia* Schauer,[96] described as a relative of *Coelestina* (=*Ageratum* L.), has been retained in essentially the same position by

[93] Linnaea **9**: 269. 1834.

[94] Herzog, Veget. der Erde **15**: 1. 1923.

[95] Proc. Amer. Acad. **32**: 24. 1896.

[96] Linnaea **19**: 716. 1847.

Bentham and Hooker, O. Hoffmann, and Robinson,[97] none of whom was able to examine specimens. The single species, *A. heteropoda*, was based on *Aschenborn* 319 and 680, from near Tucabaya, Mexico. In the Schultz Bipontinus Herbarium are two small branches, together with detached leaves and a pocket of fragments, and with them two labels in Schultz's handwriting, pinned together. Both bear Schauer's name with a mark of affirmation, indicating that they are authentic material. One bears also the data "Mexico circa Tacubayam C. Ehrenberg! n. 680 Aschenborn;" the other "Mexico circa Tacubayam Aschenborn! n. 319 & 680." There is also on the sheet a single leaf of the same plant, labeled *Ehrenberg* 319, with the same locality as the others, and in addition a pocket of fragments from Willdenow's herbarium (no. 15301), with an unpublished name which it is not necessary to cite. The writer is not able to solve the problem presented by the attribution to both Aschenborn and Ehrenberg of the same number for the same plants, but in any case it is certain that this material can be taken as authentic, agreeing closely, as it does, with Schauer's description. All of it is *Calea zacatechichi* Schlecht., and Schauer's genus and species can at last be reduced to synonymy under that name. The generic identity was recognized by Schultz, but he failed to note the specific identity, and has an unpublished new combination based on Schauer's name.

A brief statement of the identity of *Aschenbornia heteropoda*, without discussion, was given by the writer in the addenda to Standley's "Trees and shrubs of Mexico."[98]

Tridax brachylepis Hemsl. Biol. Centr. Amer. Bot. **2**: 207. 1881.

Tridax galeottii Klatt, Leopoldina **23**: 145. 1887.

Ptilostephium galeottii Schultz Bip.; Klatt, Leopoldina **23**: 146. 1887, as synonym.

Tridax tuberosa Robins. & Greenm. Proc. Amer. Acad. **32**: 4. 1896.

Tridax pringlei Robins. & Greenm. Proc. Amer. Acad. **32**: 4. 1896.

In publishing *Tridax galeottii*, Klatt cited *Liebmann* 558 and 693 and *Galeotti* 2472, in the order given. Robinson and Greenman, in their revision of the genus, placed [99] the species between *T. bicolor* and *T. coronopifolia* on the basis of Klatt's unsatisfactory description, but later [1] considered it identical with their *T. tuberosa* of 1896 and adopted Klatt's name in place of the latter. They were led to this course by an examination of two drawings labeled *T. galeottii* in the Klatt Herbarium, one of which they considered to represent *T. tuberosa*, the other *T. brachylepis*. Klatt's description of the leaves as "irregularly lobate" was taken to indicate that the former species was the one principally intended in his diagnosis.

Through the kindness of Mr. C. A. Weatherby, there are available for study the two drawings from the Klatt Herbarium, as well as the types of *T. tuberosa* and *T. pringlei*. The material of *T. galeottii* in the Copenhagen Herbarium (*Liebmann* 558 and two sheets of 693) is also before the writer, as well as three sheets (*Pringle* 8372, *E. W. Nelson* 1423, and *Conzatti & González* 560) in the U. S. National Herbarium, which have been referred to *T. brachylepis*. In 1925 the material in the Schultz Herbarium (*Liebmann* 558 and 693, and *Galeotti* 2472) and the type of *T. brachylepis* (*Galeotti* 2024) at Kew were examined, and a photograph of the first and last of the specimens mentioned in the Schultz Herbarium and small fragments from the type of *T. brachylepis* were obtained.

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[97] Proc. Amer. Acad. **49**: 435. 1913.

[98] Contr. U. S. Nat. Herb. **23**: 1681. 1926.

[99] Proc. Amer. Acad. **32**: 8. 1896.

[1] Proc. Bost. Soc. Nat. Hist. **29**: 106. 1899.

The material in the Schultz Herbarium was later forwarded for more detailed comparison. All these specimens are from Oaxaca.

Careful examination of this assembled material has failed to bring to light any differences that may be considered specific or even varietal. In the tuberous-thickened root (when present in the specimens), the habit, the pubescence of stem, leaves, and peduncles, the involucre, and the details of head the plants are identical. There is a certain amount of variation in the density of the leaf-pubescence, but its character is the same in all. Hemsley described *T. brachylepis* as "herba annua, erecta," but his specimen lacks the base, and these characters must have been conjectural. *Pringle* 8372, which the writer considered on comparison an excellent match for his type, has a large tuberous root. The only differences of possible specific significance are shown by the leaves. Hemsley described his species as having ovate-lanceolate, obtuse, remotely callous-dentate or sometimes obscurely lobate leaves. Klatt described those of *T. galeottii* as cuneate and irregularly lobate. Robinson and Greenman distinguished their two new species mainly by foliage characters: In *T. tuberosa* the leaves were 3-cleft with sharply toothed, acute lobes, and in *T. pringlei* lanceolate, dentate or subentire, obtusish. Comparison of all this material leaves no doubt that it represents a single species, somewhat variable in leaf form (but no more so than some other species of *Tridax*), in which *T. pringlei* represents the extreme with smallest, narrowest, and most nearly entire leaves, and *T. tuberosa* that with most deeply divided leaves. Most of the specimens are intermediate.

The two drawings in the Klatt Herbarium are good sketches of two of the sheets in the Copenhagen Herbarium. One of them, drawn from *Liebmann* 558, represents the form with broad 3-lobed and repand-dentate leaves. The other, drawn from one of the sheets of *Liebmann* 693, shows a plant with shallowly repand-dentate leaves and another with them more deeply repand-dentate or even 5-lobed. Robinson and Greenman's identification of *T. galeottii* with their *T. tuberosa* was based on the drawings of the two specimens with more deeply lobed leaves.

Tridax coronopifolia (H. B. K.) Hemsl. Biol. Centr. Amer. Bot. **2**: 207. 1881.
Ptilostephium coronopifolium H. B. K. Nov. Gen. &. Sp. **4**: 255. *pl. 387*. 1820.
Ptilostephium trifidum H. B. K. Nov. Gen. & Sp. **4**: 255. *pl. 388*. 1820.
Tridax trifida A. Gray, Proc. Amer. Acad. **15**: 39. 1879.
Tridax lanceolata Klatt, Leopoldina **23**: 145. 1887.

Klatt's *Tridax lanceolata*, somewhat doubtfully retained as distinct from *T. coronopifolia* by Robinson and Greenman [2] in their revision of the genus, was based on *Liebmann* 205, from Tehuacan, Puebla, Mexico, and *Berlandier* 1063, from Cuernavaca, Morelos. Both numbers have been studied in the Schultz Bipontinus Herbarium. They represent a form with narrow entire leaves which can not be separated from *T. coronopifolia*, a species notable for the variability of its leaves. The pappus is about half as long as the achenes, as it is in the type of *Ptilostephium trifidum* H. B. K., rightly united by Robinson and Greenman with *T. coronopifolia*.

Tridax ehrenbergii Schultz. Bip.; Klatt, Leopoldina **23**: 145. 1887.

The sheet of *Tridax ehrenbergii* in the Schultz Herbarium contains two specimens, one a fairly good one, lacking the head but with a pocket containing achenes and corollas, of *Liebmann* 598 (Chinantla, Mexico, July 1841), the other a poor fragment of *Ehrenberg* 61 ("Mexico pr. Jucualtepam"). The ticket of the latter bears a diagnosis in Schultz's handwriting. Both specimens are Caleas of the little known *C. sabazioides* group, and although similar in most respects they have a different pappus and apparently represent different species. Although

[2] Proc. Amer. Acad. **32**: 9. 1896.

Schultz's name and unpublished diagnosis were evidently based on Ehrenberg's plant, which has a pappus considerably longer than the achene, the name as first published with description by Klatt refers to *Liebmann* 598, with pappus shorter than the achene, and the identification of the species must rest on this collection. As suggested by Robinson and Greenman,[3] the plant is a *Calea* and not a *Tridax*, and it appears to be identical with *Calea sabazioides* (Less.) Hemsl., if *Nelson* 3232, from near San Cristobal, Chiapas (U. S. Nat. Herb.) is properly referred to that still doubtful species, the type of which has not been critically examined by any author since its description.

Tridax palmeri A. Gray, Proc. Amer. Acad. **15**: 38. 1879.

Tridax imbricatus [sic] Schultz Bip.; Klatt, Flora **68**: 202. 1885.

Tridax imbricata Schultz Bip., poorly described by Klatt and compared with *T. coronopifolia*, was at first placed near that species by Robinson and Greenman [4] and regarded as doubtfully distinct. In a subsequent note, after examination of the very poor material (lacking heads) in the Klatt Herbarium, these authors adopted [5] Schultz's name for the species they had described [6] as new under the name *T. petrophila*. Study of the better material of the type collection (*Ehrenberg* 355) in the Schultz Bipontinus Herbarium shows that this course was incorrect. Schultz's type has large white or rosy rays about 1 cm. long, a strongly graduate, densely glandular-pilose involucre 9 mm. high, and pappus (3 mm. long) about equaling the achene, and is clearly identical with *Tridax palmeri* A. Gray. It must be referred to the synonymy of that species, and the name *Tridax petrophila* again adopted for Robinson and Greenman's species.

Tridax procumbens L. Sp. Pl. 900. 1753.

Balbisia canescens Pers. Syn. Pl. **2**: 470. 1807.

Tridax procumbens β. canescens DC. Prodr. **5**: 679. 1836.

The synonyms of Persoon and DeCandolle are omitted in Robinson and Greenman's revision of Tridax.[7] No authentic material of Persoon's species, collected by Richard at Santa Marta, Colombia, has been examined, but specimens from the same locality so labeled, collected by Bertero, presented by Balbis, and preserved in the Prodromus Herbarium as well as in the Schultz Bipontinus Herbarium are normal *Tridax procumbens L.*

Oxypappus seemannii (Schultz Bip.) Blake.

Chrysopsis scabra Hook. & Arn. Bot. Beechey Voy. 434. 1841. Not *Chrysopsis scabra* Ell. 1823 (?).

Oxypappus scaber Benth. Bot. Voy. Sulph. 118. *pl. 42*. 1844.

Pectis seemannii Schultz Bip. in Seem. Bot. Voy. Herald 309. 1856.

Pentachaeta gracilis Benth. in Hook. Icon. Pl. **12**: 1. *pl. 1101*. 1872.

Oxypappus gracilis A. Gray; O. Hoffm. in Engl. & Prantl, Pflanzenfam. **4**[5]: 257. 1890, without synonym.

The identity of all these specific names has long been recognized, but the preoccupation of the name *Chrysopsis scabra* has been passed over.

Vasquezia anemonifolia (H. B. K.) Blake.

Unxia anemonifolia H. B. K. Nov. Gen. & Sp. **4**: 279. *pl. 402*. 1820.

Villanova anemonefolia Less. Syn. Gen. Comp. 256. 1832.

This Colombian and Venezuelan species appears different from the forms occurring from Ecuador to Bolivia and Peru. The pedicels and involucre are not

[3] Proc. Bost. Soc. Nat. Hist. **29**: 107. 1899.
[4] Proc. Amer. Acad. **32**: 9. 1896.
[5] Proc. Bost. Soc. Nat. Hist. **29**: 107. 1899.
[6] Proc. Amer. Acad. **32**: 5. 1896.
[7] Proc. Amer. Acad. **32**: 7. 1896.

glandular, and the former are densely pilose with mostly erect, not obviously jointed hairs; the rays are 5 to 7, the disk flowers 6 to 9; the leaves are densely pilose and with comparatively broad divisions. To it are referred *Rusby & Pennell* 1215, *Pennell* 2213, and *Pennell, Killip, and Hazen* 8753, all from the Departments of Caldas and Cundinamarca, Colombia, as well as *Jahn* 973 from Páramo de Canaguá, Province of Mérida, Venezuela, the last a coarser form with less divided leaves. *Rusby & Pennell* 1215 has been compared by the writer with the type of *Unxia anemonifolia* H. B. K., from "Nova Hispania?," in the Humboldt and Bonpland Herbarium at Paris.

The well known name *Villanova* Lag.[8] being preoccupied by *Villanova* Orteg.,[9] Rydberg [10] has taken up for the genus Philippi's name *Vasquezia* (so spelled by Philippi, but written *Vasquesia* by Rydberg). Ortega's name was based on his *Villanova bipinnatifida*, which is *Parthenium hysterophorus* L. There seems consequently no possibility that Ortega's name, which has not been used for over a century, will ever figure except in synonymy. *Villanova* Lag., however, is only a small genus of about half a dozen species, none of which are of any economic importance, and the change of name is a matter of no great significance. The South American species are poorly described and in a state of confusion that can be cleared only by examination of type material.

Blennosperma nanum (Hook.) Blake, Proc. Biol. Soc. Washington **39**: 144. 1926.

Chrysanthemum? nanum Hook. Fl. Bor. Amer. **1**: 320. 1834.

Coniothele californica DC. Prodr. **5**: 531. 1836.

Blennosperma californicum Torr. & Gray, Fl. N. Amer. **2**: 272. 1842.

Hooker's type of *Chrysanthemum ? nanum*, collected on the "North-West coast of America" by Menzies, is identical with *Coniothele californica* DC., as long ago noted by Asa Gray.[11] Gray's brief statement of its identity, at the beginning of his account of the genus *Chrysanthemum*, has been overlooked by later writers, and Hooker's name seems to be omitted from the "North American Flora."

Soliva sessilis Ruiz & Pav. Fl. Peruv. Chil. Prodr. 112. 1794.

Soliva barclayana DC. Prodr. **6**: 143. 1837.

Gymnostyles barcklayana Steud. Nom. Bot. ed. 2. **1**: 713. 1840.

Soliva sessilis var. *barclayana* Baker in Mart. Fl. Bras. **6**[3]: 294. 1884.

Soliva barclayana DC., based on specimens collected in Barclay's garden in England on July 18, 1830, by Alphonse DeCandolle, which had been grown from seed from "America merid." without definite locality, has not since been recognized. The type specimens in the DeCandolle Herbarium are *Soliva sessilis* Ruiz & Pav. and the name may now be placed in the synonymy of that species. The two upper lobes of the achene referred to in DeCandolle's description are the two spiny teeth at its apex which in the type are sometimes inflexed, as described by DeCandolle and as is frequent in *S. sessilis*, and sometimes erect.

Liabum hypoleucum (DC.) Blake, Proc. Biol. Soc. Washington **39**: 144. 1926.

Vernonia hypoleuca DC. Prodr. **5**: 27. 1836.

When transferring this species to *Liabum*, the writer suggested that it was probably a Peruvian species, although attributed by DeCandolle to Mexico. However, having since carried out in another connection a review of the South

[8] Gen. & Sp. Nov. 31. 1816.

[9] Hort. Matr. Dec. 47. 1797.

[10] N. Amer. Fl. **34**: 41. 1914.

[11] Syn. Fl. **1**[2]: 364. 1884.

American species without finding any group to which it may be referred, the writer has now no doubt that it is really a Mexican or Central American plant. It is clearly a member of the group distinguished generically by Rydberg [12] under the name *Sinclairia* Hook. & Arn., but appears not to agree entirely with any species described by him, although it comes near *S. brachypus* Rydb.

Centaurea melitensis L. Sp. Pl. 917. 1753.

Calcitrapa patibilcensis H. B. K. Nov. Gen. & Sp. **4**: 23. 1820.

Centaurea americana Spreng. Syst. Veg. **3**: 407. 1826. Not *Centaurea americana* Nutt. 1821.

Centaurea patibilcensis DC. Prodr. **6**: 593. 1837.

In the Index Kewensis *Calcitrapa patibilcensis* is referred to *Centaurea americana* and its synonym, *Centaurea patibilcensis*, to *Centaurea melitensis*. The latter reference, as shown by an examination of the type (*Bonpland* 3768, Patibilca, Peru, in the Paris Herbarium), is the correct one, and the former is probably owing to confusion between *Centaurea americana* Spreng. (a renaming of *C. patibilcensis*) and *Centaurea americana* Nutt.

Moquinia blanchetiana (DC.) Blake.

Baccharis blanchetiana DC. Prodr. **7**: 281. 1838.

Moquinia flavescens Gardn. Lond. Journ. Bot. Hook. **6**: 458. 1847.

These names have already been equated by Baker,[13] who examined the type collections of both species. The writer has examined the type specimen of *Baccharis blanchetiana* and the type collection of *Moquinia flavescens*, but without an opportunity to compare them. The specific identification of DeCandolle's name rests on the authority of Baker.

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[12] N. Amer. Fl. **34**: 295. 1927.

[13] In Mart. Fl. Bras. **6**[3]: 347. 1884.

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ASIATIC PTERIDOPHYTA COLLECTED BY JOSEPH F. ROCK 1920–1924

By CARL CHRISTENSEN

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II

PREFACE

The accompanying paper by Dr. Carl Christensen, curator of the Copenhagen Botanical Museum, is a report upon the ferns and fern allies collected by Joseph F. Rock in southeastern Asia from the middle of 1920 to March, 1924, while engaged in botanical and ethnological field work. During the early part of this period Mr. Rock was employed as agricultural explorer for the Bureau of Plant Industry, United States Department of Agriculture, and gave special attention to an investigation of the sources of chaulmoogra oil, at that time a little known specific for leprosy, among the forests of the Burma-Yunnan border region. The exploration was carried also far into the Province of Yunnan, southwestern China, and in February, 1923, was taken over by the National Geographic Society and was conducted under the auspices of the society for more than a year, the herbarium specimens (nearly 80,000 in number) from both sources being turned over to the United States National Museum.

The collections thus brought together are notable for their large representation of primroses, rhododendrons, and ferns, and the National Museum is fortunate in being able to present a critical analysis of the fern material by Doctor Christensen, a special student of the Asiatic species of this difficult group. All of Mr. Rock's pteridophyta from the regions mentioned, and of his smaller collections from Siam and Tibet, are cited in the present paper, with frequent reference to much historically important material collected by earlier explorers.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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ASIATIC PTERIDOPHYTA COLLECTED BY JOSEPH F. ROCK 1920–1924

By Carl Christensen

INTRODUCTION

Some time ago Dr. William R. Maxon, associate curator of the United States National Herbarium, proposed that we should identify jointly the large number of pteridophyta collected in Siam, Burma, and Yunnan by Joseph F. Rock, and publish a report upon them. There was sent to the Botanical Museum of Copenhagen at the same time an almost complete set of the plants in question. I was just finishing, however, a report upon another large collection of ferns made by Dr. Harry Smith in Szechwan and Chile, and when Doctor Maxon had read this[1] he suggested that I should undertake the work alone, and sent to me all the unicates of the Rock pteridophyta in the United States National Herbarium. Owing to work on the history of Danish botany, which occupied most of my time from 1920 to 1926, I was obliged to postpone study of the Rock ferns; but the historical manuscript was finished in the summer of 1926, and at intervals since that time I have done my best to identify the numerous species represented by the material placed in my hands.

The ferns here discussed were gathered by Mr. Rock during the years 1920 to 1924. A small portion were collected in northern Siam, in a previously unexplored region, and a report upon them forms the second part of the present brochure. The great bulk of the material, however, was collected in the vicinity of the Burma-Yunnan border—northern Burma, and Keng Tung Territory in the Shan States—and in southern Yunnan, mostly on the heavily forested mountain ridges between the Mekong and Salween Rivers. More than a few specimens were collected on the slopes of the Likiang Snow Range, some on Mount Kenyichunpo in southeastern Tibet, a few also in northern Yunnan in the Valley of the Yangtsze, and a single specimen from southeastern Szechwan remarkably enough

[1] Plantae Sinenses: Pteridophyta. Medd. Bot. Trädg. Göteborg 1: 42–110. *pl. 16–20.* 1924.

belonging to a species (*Asplenium ensiforme*) not previously known from that province.

Nearly all the specimens are complete, often consisting of entire fronds 1.5 to 2 meters long, thus in the case of several large species affording me a knowledge as to size, shape, and proportions that it is difficult to get ordinarily without seeing the plants in the field. Most species of the collection are true forest ferns, among them a good many epiphytes; relatively few alpine species are present. The collection is perhaps the largest made in these regions, at least since Dr. Augustine Henry brought home, 30 years ago, his very rich harvest of plants, which for the first time unveiled to wondering botanists the extraordinarily rich flora of southwestern China. The ferns collected by Henry were determined independently by J. G. Baker at Kew and Dr. H. Christ in Basel, and both these pteridologists based a large number of supposed new species upon this material. No wonder that some of these were described twice, and under different names! It is scarcely excusable, however, that a number of Baker's new species should be published in the Kew Bulletin in 1906, notwithstanding that most of them had already been described by Christ in 1899 and 1900. Still more remarkable is the fact that not a few of these "new" species proposed by Baker in 1906 are based on the same collection numbers and are identical with species described by Baker himself in the Kew Bulletin for 1898. The explanation may be that Kew obtained a set of Henry's plants twice, and that Baker determined the second set without comparing the specimens with those of the first. By the kindness of Dr. A. W. Hill, director of the Royal Botanic Gardens, Kew, I have had on loan, in 1924 and more recently, most of the type specimens of Baker's species, and have thus been able to reduce a very large number of them to synonymy. Baker's descriptions are so short and very often so wrong, and many of them based on such poor specimens, that it is not to be wondered that students have been unable to identify later material with certainty. Thus Doctor Christ has often misapplied Baker's names to specimens that are totally different from the originals.

During the years 1899 to 1910 Christ published a long series of papers on Chinese ferns, and described scores of new species. I have known for a long time that some of these are very weakly characterized, that others had previously been described by Baker, and that Christ himself had not infrequently described the same species twice or even thrice. It must be admitted that Christ had a very sharp eye for distinguishing related forms, and that not a few of his proposed new species will perhaps be regarded as valid by certain modern pteridologists who draw very narrow boundaries for a

"species." On this point I take a conservative stand. We all know that most of our northern ferns vary considerably in size, cutting, density of pubescence, scales, etc., and I see no reason to suppose that tropical species may not vary to the same extent. Working with Chinese ferns we are on pioneer ground; we seldom have for study more than a few specimens of a given species. It is therefore nearly impossible to know the true range of variation.

On the other hand, it is quite clear to modern botanists that it is wholly unnatural to merge under a single species widely different forms, as is very often done in the Synopsis Filicum and in Clarke's and Beddome's works on the ferns of India. My problem has been to find a golden mean between these extreme points of view, and fortunately we have in the so-called minute characters a means of solving most of these questions. These characters, based for instance on dermal outgrowths (hairs and scales), spores, and hydathodes, must not be misused, of course, as by the late Professor Hieronymus in his latest very long descriptions, where he laid great weight upon the size of the scales and the size and shape of their cells, or when he found the only difference between his new species *Antrophyum henryi* and *A. coriaceum* Wall. to lie in the different length of the terminal cell of the paraphyses. Experience has taught me that scarcely two individuals are fully alike as to such "characters," and we note also that Hieronymus based a majority of his more recent new species upon a single specimen. I have found it absolutely impossible to identify specimens of *Angiopteris* from his descriptions. Distinctive minute characters that can be described in a way intelligible to everyone are in my opinion of the highest value; but unfortunately they are never mentioned by Baker and rarely by Christ, and a positive identification of the new species proposed by these writers is possible in most cases only when one has at hand for comparision the actual type specimens or, at least, cotypes. As mentioned above, I have had most of the type specimens of Baker's species on loan from Kew, and while in Paris in 1924 I went through Christ's herbarium, then intercalated in the herbarium of Prince Roland Bonaparte, and obtained authentic specimens or fragments of most of the new species. Furthermore, I have had on loan from Berlin the type specimens of the new species described in Hedwigia in 1916 by the late G. Brause, and have received also numerous authentic specimens from Prof. E. Rosenstock, Gotha. I have thus found myself in a position to identify with some assurance the ferns of the Rock collection and to carry that work out critically.

The following report is therefore not a bare list of names, inasmuch as I have often added supplementary and critical remarks to earlier descriptions. In my paper on Dr. Harry Smith's ferns

from Szechwan (1924) I published similar remarks on a number of species, and these are not here repeated. As will be seen from the list, I have had to reduce to synonymy a very large number of names, some of which belong to species well known from the Himalaya and clearly described as species or varieties by C. B. Clarke in his Review of the Ferns of Northern India.[2] It appears that Christ rarely consulted this valuable treatise, for several of his supposed new species from Yunnan were known as Himalayan by Clarke. It can not be denied that the fern flora of Yunnan is very rich in endemic species, yet the very large number listed by Matthews[3] and by Léveillé[4] must be considerably reduced. Many of them believed to be endemic are not, several being known also from the eastern Himalaya and Assam and others extending eastward to Japan.

In the first part of the present paper I enumerate all species collected by Mr. Rock in Burma, Yunnan, and southeastern Tibet. Most of them were gathered on both sides of the Burma-Yunnan border, in regions of similar character, and it would be quite unnatural to let the political boundary play any rôle in this list; nevertheless, under each species I have arranged the localities under three headings: Burma, Yunnan, and southeastern Tibet. All numbers collected are cited, but I have not, as a rule, quoted full locality data.

The whole collection contains 293 species. Of these, 275 are found in Burma, Yunnan, and Tibet, 1 in Szechwan, and 60 in Siam.

Besides 6 species here described as new, the following 13 species are recorded for the first time for China: *Alsophila khasyana*, *Dryopteris crinipes*, *D. apiciflora*, *D. sikkimensis*, *Polystichum foeniculaceum*, *Tectaria vasta*, *Leucostegia dareaeformis*, *Humata assamica*, *Athyrium foliolosum*, *Ceterach dalhousiae*, *Pteris heteromorpha*, *P. wallichiana*, *P. dissitifolia*, and *Polypodium wardii*, all but one previously known from British India. Several others now found in Yunnan have been known formerly from Kweichou or Szechwan, e. g. *Drymotaenium*, *Pteris esquirolii*, *Polypodium sikkimense*, *P. rhynchophyllum*, *Campium angustipinnum*, *Polystichum stenophyllum*, and *Asplenium cheilosorum*.

The following species found in Burma seem to be new for the Indian Empire: *Dryopteris lofouensis*, *D. subelata*, *D. hirtisora*, *Polystichum punctiferum*, *Athyrium dissitifolium*, *Diplazium viridissimum*, *Woodwardia japonica*, *Pteris esquirolii*, *Polypodium oligolepidum*, *P. neurodioides*, and *P. sublineare*.

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[2] Trans. Linn. Soc. II. Bot. 1: 425–611. *pl. 49–84*. 1880. Often quoted as "Review," only.

[3] Enumeration of Chinese Ferns. Journ. Linn. Soc. Bot. **39**: 339–393. 1911.

[4] Catalogue des Plantes du Yun-Nan. Pp. 1–300. Le Mans, 1916.

The type specimens of most of the new species are in the Botanical Museum of Copenhagen, cotypes in the United States National Herbarium.

The systematic arrangement of genera is, as a whole, that followed in my Index Filicum, which differs considerably from the usage of American fern students. It is not a good one, but I do not wish to change it at present, because in my earlier papers on Chinese ferns the same sequence is followed. I have, however, made a notable exception in the case of the very unnatural group "*Leptochilus*," which is here divided into two genera: *Leptochilus* proper, related to *Polypodium*, and *Campium*, placed in the Dryopterideae. Minor changes will be found here and there. The nomenclature is mainly that of my Index Filicum. When no change is made I have refrained from referring to the publications in which the species is named or described, inasmuch as all necessary references are found in the Index; when I deviate from the usage of the Index, the fact is always pointed out. My preferring the name *Tectaria* for *Aspidium* needs no comment, nor the treatment of *Leucostegia* as a genus.

Finally, it is a pleasant duty to thank Doctor Maxon most heartily for his kindness in suggesting that I undertake this work, which has been difficult but by no means tedious, and for his generous interest which led to sending the exceedingly fine set of Mr. Rock's pteridophyta to the Botanical Museum of Copenhagen. To the directors of the Royal Botanic Gardens, Kew, and the Botanical Garden and Museum at Berlin I tender my sincere thanks for their kindness in lending me the type material of many species.

PTERIDOPHYTA FROM BURMA, YUNNAN, AND TIBET

OPHIOGLOSSACEAE

BOTRYCHIUM Swartz

Botrychium lanuginosum Wall.
YUNNAN: West of Talifu, en route to Tengyueh (6665).

MARATTIACEAE

ANGIOPTERIS Hoffm.

Angiopteris caudatiformis Hieron. Hedwigia **61**: 278. 1919.
BURMA: Keng Tung Territory, Meh Lui watershed (2323).
YUNNAN: Along the banks of the Meh Kong, near Keng Hung (2554).

SCHIZAEACEAE

LYGODIUM Swartz

Lygodium japonicum (Thunb.) Swartz.
Yunnan-Burma border, near Hsia Sin Gai (7826).

Lygodium flexuosum Swartz.
BURMA: Myawaddi to Kawkereik Hills, Lower Burma (678). Keng Tung Territory: Between Pang Mah Ki Hat and Muang Len (1975); Meh Lui watershed (2279).
YUNNAN: Between Chieng Law and Muang Hun (2381).
No. 678 should be referred perhaps to var. *alta* Clarke.

Lygodium polystachyum Wall.
BURMA: Keng Tung Territory, Muang Len (2017).

GLEICHENIACEAE

DICRANOPTERIS Bernh.

Dicranopteris linearis (Burm.) Underw.
YUNNAN: Between Tengyueh and Lungling (7173).
Another specimen from the same locality (7172) is probably a young sterile branch of the same species. It is of gigantic size, with pinnae 35 cm. long, the segments 7 to 8 cm. long by nearly 1 cm. wide.

HYMENOPHYLLACEAE

HYMENOPHYLLUM J. E. Smith

Hymenophyllum exsertum Wall.
Hymenophyllum delavayi Christ, Bull. Soc. Bot. France **52**: 11, 1905. (*Delavey* 3637!)
YUNNAN: Between Tengyueh and Lungling (7216).

Hymenophyllum microsorum v. d. B.
BURMA: Between Sadon and the Yunnan border (7396).

Hymenophyllum australe Willd.

BURMA: Between Sadon and the Yunnan border (7445).

YUNNAN: Between Tengyueh and the Burmese border (7335). Between Kambaiti and Tengyueh (7556).

All the specimens belong to *H. crispatum* Wall., which is kept distinct by Professor Nakai in his recent Key to the Japanese Hymenophyllaceae.[5] Perhaps he is right, though it is difficult to say precisely how *H. crispatum* may be distinguished from the many other forms grouped under the name *H. australe*.

Hymenophyllum khasianum Baker.

BURMA: Between Sadon and the Yunnan border (7442, 7445a).

YUNNAN: Between Tengyueh and Lungling (7186a).

Identified from the description of *Leptocionium flaccidum* v. d. B. and Clarke's illustration. (Review, *pl. 49, f. 2.*) The plant illustrated is larger, but the sori are just as in our specimens, with the valves of the indusium long and truncate-obtuse.

Hymenophyllum khasianum is closely related to *H. barbatum* (v. d. B.) Miquel and very likely represents a larger tropical form of that species, which is widely distributed in China and has been described by Baker and Christ under new names. Thus, *H. henryi* Baker, from Hupeh (*Henry* 5457; Kew!), seems to me rather large but typical *H. barbatum*, and *H. omeiense* Christ, from Mount Omei (*Wilson* 5364!), is very nearly identical with it. More different in habit is *H. fastigiosum* Christ, though it may be a form of the same species.

No. 7186a, a single specimen, is referred here with doubt.

TRICHOMANES L.

Trichomanes auriculatum Blume.

YUNNAN: Between Kambaiti and Tengyueh (7532).

CYATHEACEAE

CYATHEA J. E. Smith

Cyathea brunoniana (Wall.) Clarke & Baker.

Alsophila costularis Baker, Kew Bull. Misc. Inf. **1906**: 8. 1906.

BURMA: Between Sadon and the Yunnan border; "trunk 25 feet high; crown subhorizontal" (7464).

YUNNAN: Between Tengyueh and the Burmese border (7317).

The indusium is a very shallow cup that soon breaks down, often leaving a patelliform scale only. Thus the species properly belongs to *Hemitelia*, sect. *Amphicosmia;* but it seems to me quite unnatural to separate from *Cyathea* the species of this section, or at least those occurring in the Old World.

The present plant is a very close ally of *C. spinulosa*, differing from it by the hairy costae and costules and the small indusia. The type specimen of *Alsophila costularis* Baker, from Yunnan (*Henry* 13136; Kew!), is exactly identical with Rock's material. Baker overlooked the presence of an indusium.

ALSOPHILA R. Br.

Alsophila glabra (Blume) Hook. PLATE 13.

BURMA: Keng Tung Territory: Between Muang Len, Pang Kha Luang, and Muang Hpyak (2032, 2041); between Pang Sop Lao and Ban Yang Kha, valley of the Meh Len (2153); Meh Lui watershed (2341).

EXPLANATION OF PLATE 13.—*Alsophila glabra.* Along brook, Meh Lui watershed, Keng Tung Territory, Burma, at 900 meters elevation; *Rock* 2341.

[5] Bot. Mag. Tokyo **40**: 242. 1926.

Here may be mentioned the following critical species of southern China, closely related to *Alsophila glabra:*

Alsophila henryi Baker, Kew Bull. Misc. Inf. **1898**: 229. 1898 (Yunnan, *Henry* 11451; Kew!).

Aspidium lamprocaulon Christ, Bull. Acad. Géogr. Bot. **16**: 117. 1906 (Szechwan, *Wilson* 5397; Herb. Christ!).

Dryopteris lamprocaulis C. Chr. Ind. Fil. Suppl. 34. 1913.

Alsophila glabra var. *cavaleriana* Christ, Bull. Acad. Géogr. Bot. **20**[5]: 141. 1910. (Kweichou, *Cavalerie* 3385!).

This differs chiefly from *A. glabra* by its broader, much more deeply pinnatifid pinnules and its serrate segments, the veins 7 to 9 jugate, simple or rarely furcate, and it may be no more than a form of that species.

Alsophila glauca (Blume) J. Smith.

BURMA: Keng Tung Territory, Valley of the Meh Len (2097).

Alsophila khasyana Moore.

BURMA: Between Sadon and the Yunnan border (7431).

New to China. Typical.

CIBOTIUM Kaulf.

Cibotium barometz (L.) J. Smith. PLATE 14

BURMA: Keng Tung Territory: Between Muang Len and Meh Kong (2004); Meh Lui watershed (2298, 2305, 2313); between Keng Hung and Muang Hing (2651).

I do not agree with Christ[6] in considering *C. assamicum* Hook. distinct from *C. barometz.* It is a larger form with serrate segments, with 5 or 6 pairs of sori to each. No. 2004 is this form; no. 2298 is intermediate between it and the typical plant.

EXPLANATION OF PLATE 14.—*Cibotium barometz,* in forest, Keng Tung Territory, Burma, at 900 to 1,050 meters elevation. A, *Rock* 2298; B, *Rock* 2004, the fronds 3 meters long.

POLYPODIACEAE

DIACALPE Blume

Diacalpe aspidioides Blume.

YUNNAN: Between Tengyueh and the Burmese border (7344). East of Tengyueh (7628, 7694).

BURMA: Between Sadon and the Yunnan border (7481, 7483, 7511).

WOODSIA R. Br.

Woodsia lanosa Hook.

YUNNAN: Eastern slope of Likiang Snow Range (6011).

CYSTOPTERIS Bernh.

Cystopteris setosa Bedd.

YUNNAN: East of Tengyueh, Hsia Ping Ho (7722).

A small form of this interesting species, the systematic position of which appears to me very doubtful; its place in the present genus seems wholly unnatural.

ACROPHORUS Presl

Acrophorus stipellatus (Wall.) Moore.

BURMA: Between Sadon and the Yunnan border (7392, 7441).

YUNNAN: Between Tengyueh and the Burmese border (7353).

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[6] Philippine Journ. Sci. Bot. 2: 117. 1907.

MATTEUCCIA Tod.

Matteuccia orientalis (Hook.) Trev.

YUNNAN: Salween Ridge (6997). Between Kambaiti and Tengyueh 7569).

DRYOPTERIS Adans.

Dryopteris calcarata var. **sericea** (Scott) C. Chr.

Lastrea sericea Scott; Bedd. Ferns Brit. Ind. *pl. 308.* 1869. Not *Dryopteris sericea* C. Chr. Bot. Gaz. **56**: 136. 1913.

Aspidium ciliatum Wall. List, no. 351. 1828 (*nomen*).

Nephrodium calcaratum var. *ciliatum* Baker in Hook. & Baker, Syn. Fil. ed. 2, 494. 1874.

Nephrodium ciliatum Clarke, Trans. Linn. Soc. II. Bot. **1**: 514. 1880, not Desv. 1827.

Lastrea calcarata var. *β sericea* Bedd. Handb. Ferns Brit. Ind. 237. 1883.

BURMA: Keng Tung Territory: Valley of the Meh Len (2185); between Pang Hoi Hpi and Peng Sai (2206).

YUNNAN: Between Chieng Law and Muang Hun (2378). Between Keng Hung and Muang Hing (2719).

Although I am tolerably sure that this form is specifically different from genuine *D. calcarata*, I prefer to place it provisionally under that species as a variety, partly because I have a specimen from Annam (*Cadière* 21) that is intermediate between it and the true *D. calcarata*, and partly because no name ascribed to it thus far would be valid specifically. In size, pubescence, and lack of auriculiform pinnae our plant is essentially like *D. calcarata*, but the pinnae are less cut, the lobes less oblique, and the sori closer to the costule. The pinnae are rarely as much as 5 cm. long and 1 cm. broad, and are often obtuse but also sometimes acuminate, the upper basal lobe less elongate.

Dryopteris falciloba (Hook.) C. Chr.

Lastrea falciloba Hook. Journ. Bot. Kew Misc. **9**: 337. 1857.

Nephrodium falcilobum Hook. Sp. Fil. **4**: 108. 1862; Clarke, Trans. Linn. Soc. II. Bot. **1**: 515. 1880.

BURMA: Keng Tung Territory, Valley of the Meh Len (2082).

YUNNAN: Between Keng Hung and Muang Hing (2720). Between Muang Hing and the Szemao hills (2775).

I agree with Clarke in his view that this is specifically different from *D. calcarata* (Blume) Kuntze, to which it was referred as a variety by Beddome (Handbook, p. 237) and other writers. It differs chiefly in its larger size (pinnae up to 15 cm. long and 1.5 cm. wide), the presence of several auriculiform pinnae below the developed ones, and the glabrous indusia.

Dryopteris gracilescens (Blume) Kuntze.

YUNNAN: Kuyung, east of Tengyueh (7693).

Dryopteris flaccida (Blume) Kuntze.

YUNNAN: East of Tengyueh, along trail to Hsiao Ping Ho (7717).

Dryopteris ochthodes (Kunze) C. Chr.

YUNNAN: Ho Mu Shu, near Tengyueh (7853).

Dryopteris xylodes (Kunze) Christ.

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Peng Sai (2234).

YUNNAN: Between Tengyueh and Lungling (7073, 7143). Between Tengyueh and Bhamo (7836).

A leaf of no. 7143 is 2.25 meters long and 40 cm. wide.

Dryopteris tuberculifera C. Chr., sp. nov.

Rhizome creeping? Stipe solitary, up to 1 meter long, 1 cm. thick, fusco-stramineous, glabrous, with 10 to 15 pairs of small black-brown tubercles (aerophores of abortive pinnae) at distances of about 6 cm., the lowest ones about 10 cm. from the stipe base; blade ovate-lanceolate, 1 meter long (or probably more), membranous, glossy above, nearly glabrous throughout, the costae of the pinnae excepted, these short-strigose above and bearing very few whitish hairs beneath; rachis terete beneath, trisulcate above, stramineous; pinnae numerous, sessile, with a distinct aerophore, 4 to 5 cm. apart, linear-lanceolate, long-acuminate, the middle one about 30 cm. long, the lower ones somewhat abbreviated but not auriculiform, pinnatifid nearly to the costa; segments numerous, with rounded sinuses between, falcate, entire, acute, 15 to 18 mm. long, 4 mm. broad, the basal ones of middle and upper pinnae somewhat elongate, those of the lower pinnae greatly abbreviated, often obsolete; veins in about 15 pairs, very distinct on both sides, all simple, the basal ones running out to the sinus; sori near the costa (the basal ones more remote from it), 10 to 13 on each side, small; indusia reniform, brown, persistent, glabrous; sporangia glabrous.

YUNNAN: In dry sand along stream beyond Muang Hing, March 2–12, 1922 (2731, type). I have the same plant from Sikkim (*Kari* 37).

This large species was no doubt referred by Clarke to his *Nephrodium prolixum* (Review, p. 516), which besides includes *Dryopteris ochthodes* and *D. xylodes*. It seems to me, however, impossible to refer it to either of these species. It is certainly very near *D. xylodes*, agreeing in almost all characters ascribed to that species; I have compared it with typical specimens of *D. xylodes* from the Nilgiri Mountains of southern India, the type locality, with which the Rock specimens so cited fully agree. *Dryopteris tuberculifera* is a much larger fern, dark green and glossy, and essentially glabrous; the rachis is terete below, not quadrangular as in *D. xylodes;* the veins are more prominent and numerous. In general aspect the species recalls *D. erubescens* and *D. braineoides*, but these are exindusiate.

Dryopteris lofouensis Christ, Bull. Acad. Géogr. Bot. 20 [2]: 143. 1910.

BURMA: Keng Tung Territory, Valley of the Meh Len (2141).

YUNNAN: Banks of the Meh Kong, near Keng Hung (2553).

Both specimens match exactly a fragment of the type specimen from Kweichou (*Cavalerie* 3567!); but the upper part of the rachis and the costae beneath are somewhat pubescent by short whitish hairs, and the basal pinnae are similar to the others in no. 2553, though showing a tendency to becoming more compound in no. 2141, as described by Christ.

The species is very intimately related to *D. syrmatica*, but is much smaller, with the subsessile pinnae 20 cm. long by 4 to 5 cm. wide only, in cutting resembling *Tectaria austrosinensis*, mentioned below. It is certainly very near *D. microthecia* (Fée) C. Chr. (*Dryopteris metteniana* Hieron.); and like that species it differs from *D. syrmatica* in its sessile or subsessile pinnae and in bearing the sori generally almost at the tip of the anterior branch of the forked veins. Not having seen an authentic specimen of *D. microthecia* (*Cuming* 13; my specimen of this number is certainly *D. syrmatica* var. *petiolosa* Christ), I dare not identify *D. lofouensis* with it.

Dryopteris syrmatica (Willd.) Kuntze.

Dryopteris cnemidaria Christ, Bull. Acad. Géogr. Bot. 20 [2]: 140. 1910.

BURMA: Keng Tung Territory, Valley of the Meh Len (2140).

Fully identical with Assam specimens collected by Mann, as well with *D. cnemidaria* Christ from Kweichou (*Cavalerie* 3382!). It is a very large form and is perhaps specifically distinct from the Malayan type (*Aspidium spectabile* Blume). The pinnae are up to 10 cm. broad, the segments short-acuminate, not bluntish as in the type.

Dryopteris ornata (Wall.) C. Chr.

BURMA: Mong Khong Ka, between Tengyueh and Bhamo (7842).

A very tall plant, according to Beddome 15 to 20 feet high. The frond examined is 3.5 m. long, the lowest pinnae 50 cm. long by 15 cm. wide.

Dryopteris decursivepinnata (van Hall) Kuntze.

YUNNAN: Between Tengyueh and Lungling, in dense forest (7129). Foot of Salween Ridge, in forest (7594.)

Dryopteris africana (Desv.) C. Chr.

YUNNAN: Between Tengyueh and Lungling (7184).

Dryopteris khasiana C. Chr.

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Peng Sai (2212).

YUNNAN: Valley of Nam Hpang Koh, along stream (2647). Muang Hing region (2732). Between Mehei and Maokai (2914).

In cutting and venation *D. khasiana* very much resembles *D. hirtipes* and its immediate allies, but in spite of free veins its relationship is not with that species but with *D. penangiana* and others having goniopteroid venation. It differs from the subgenus *Eudryopteris* in its dark green color and imparipinnate blades, in the lack of scales above the stipe base, and in having the secondary veins not decurrent below.

Dryopteris parasitica (L.) Kuntze.

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Peng Sai (2247).

YUNNAN: Between Yu Tan Po and Man Lo (7141).

I am still unable to characterize clearly the many Asiatic forms of this collective species, and must therefore employ here the usual name for the two specimens above cited; they look rather different.

Dryopteris molliuscula (Wall.) C. Chr.

BURMA: Keng Tung Territory, Valley of the Meh Len (2189).

Dryopteris crinipes (Hook.) Kuntze.

BURMA: Keng Tung Territory, Valley of the Meh Len (2089).

YUNNAN: Nam Hpang Koh, between Keng Hung and Muang Hing, along bank of stream (2649). Between Mohei and Maokai (2951).

New to China. No. 2089 has the frond more than 2 meters long.

Dryopteris prolifera (Retz.) C. Chr.

BURMA: Keng Tung Territory, Valley of the Meh Len (2115).

Dryopteris subelata (Baker) C. Chr. Ind. Fil. Suppl. 40. 1913.

Nephrodium subelatum Baker, Kew Bull. Misc. Inf. 1906: 11. 1906.

BURMA: Keng Tung Territory, Valley of the Meh Len (2113).

YUNNAN: Between Keng Hung and Muang Hing, along shady stream banks (2573, 2593, 2717).

The only full-grown specimen in the Rock collection (no. 2593) is exactly identical with the type specimen (*Henry* 11809a; Kew!). To Baker's description may be added: Rhizome creeping, with brown pubescent lanceolate scales; blade with several pairs of distant, auriculiform pinnae below and a

rather distinct terminal pinna, this with 1 or 2 short pinnae at base; pinnae about 4 cm. apart, alternate, short-petiolate, truncate at base, acuminate, 15 to 20 cm. long, 3 cm. wide, cut one-third the way to the midrib into falcate, obtuse or subtruncate, distally acutish, dense lobes; texture subcoriaceous; veins simple, 10 to 12 jugate, raised beneath, the lower 4 or 5 pairs united; sori medial, with persistent, coriaceous, short-hairy indusia; rachis with minute, lanceolate scales; upper side of pinnae glabrous, except for the strigose costae, the under side densely downy throughout with very short erect hairs.

This is very probably one of the north Indian forms referred to *Nephrodium pennigerum* by Beddome (Handbook, p. 277). *N. pennigerum* Bedd. was supposed to be the same as the Malayan *Aspidium pennigerum* Blume, which is *Dryopteris megaphylla* (Mett.) C. Chr.; but in the supplement to his Handbook (pp. 73, 74) Beddome refers *A. pennigerum* Blume to his *N. multilineatum* (Wall.), now using the name *pennigerum* for a northeast Indian fern without auricles, which may be the following species.

Now *D. subelata* is certainly very like *D. megaphylla* from Java, but that is thinner in texture and has the veins scarcely raised, the lobes more acute, and the under side hairy on the veins only. These differences are small, it is true, and it is quite possible that *D. subelata* is after all only a form of *D. megaphylla*, to which species Christ[1] referred his specimen of *Henry* 11809 (as *Aspidium pennigerum* Blume).

Dryopteris hirtisora C. Chr., sp. nov.

In size, habit, cutting, and texture very like *D. subclata*, but differing in the absence of auriculiform pinnae below and in its coarser pubescence, small hirsute evanescent indusia, and villose sporangia.

Rhizome wide-creeping, the stipes distant, 60 to 70 cm. long, without auricles or with a single pair of abbreviated pinnae below; pinnae 20 cm. long, 18 to 25 mm. broad, lobed one-third the way down, with truncate or subacute close lobes, the upper side with scattered needle-like hairs on the veins, the lower side rather densely pubescent with long hairs on the costae and veins and shorter ones on the leaf tissue; rachis without scales, densely short-hirsute; veins about 10-jugate, the 3 lower pairs united, the following 2 running to a hyaline membrane below the sinus; sori medial or slightly inframedial; indusia small, hirsute, the head of the sporangia with 3 to many soft long hairs.

BURMA: Keng Tung Territory, along a mountain trail between Pang Hoi Hpi and Peng Sai (2208, type; 2235).

YUNNAN: Between Keng Hung and Muang Hing (2709).

Also in northern Siam: Upper slopes and summit of Doi Chom Cheng 1511, 1759).

Although *D. hirtisora* closely resembles *D. subelata*, the characters given above seem sufficient for its segregation. As mentioned under *D. subelata*, *Nephrodium pennigerum* Bedd. (Handbook, Suppl. p. 73) may be this species, although neither Clarke nor Beddome mentions the hairy sporangia.

Dryopteris truncata (Gaudin) Kuntze.

BURMA: Keng Tung Territory, between the Siamese border and Pang Mah Ki Hat (1966).

YUNNAN: Banks of the Meh Kong, near Keng Hung (2550). Valley of Nam Hpang Koh, between Keng Hung and Nuang Hing (2650).

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[1] Bull. Herb. Boiss. 7: 17. 1899.

To this species, as generally understood, belong a series of rather different forms which need a thorough revision. The specimens referred here are not closely alike.

Dryopteris moulmeinensis (Bedd.) C. Chr.

BURMA: Keng Tung Territory: Between the Siamese border and Pang Mah Ki Hat (1936, 1958); Valley of the Meh Len (2142).

YUNNAN: Banks of the Meh Kong, near Keng Hung (2526). Between Keng Hung and Muang Hing (2596). Between Tengyueh and Lungling (7093).

Variable in density of pubescence, in number and direction of veins, and in size. No. 2526 is a very large glabrescent form, the whole leaf 1.7 meters long, with 15 pairs of pinnae, these 30 to 35 cm. long and 4.5 cm. wide.

Dryopteris urophylla (Wall.) C. Chr.

YUNNAN: Along the Meh Kong, near Keng Hung; on rocks in river bed (2552).

Dryopteris cuspidata (Blume) Christ, Philippine Journ. Sci. Bot. **2**: 205. 1907.
Meniscium cuspidatum Blume, Enum. Pl. Jav. 114. 1828.

BURMA: Keng Tung Territory, Valley of the Meh Len, between Muang Hpyak and Pang Sop Lao (2136).

Well marked by the exindusiate, often confluent sori, otherwise very near *D. urophylla*.

Subgenus EUDRYOPTERIS

Dryopteris hirtipes (Blume) Kuntze.

After examination of a fair number of specimens I feel compelled to refer to this species several forms described from northern India and China as species, thus agreeing with Clarke and Beddome. I have failed to find stable characters by which they may be distinguished with certainty; scarcely two specimens are exactly identical as to scales, degree of cutting, and venation. I shall try to characterize briefly some of these forms.

f. **typica** (*Aspidium hirtipes* Blume).

Pinnae mostly short-stalked, 2 to 2.5 cm. broad, not close, incised rather deeply (incisures 5 mm. deep or more), with oblique crenate lobes, these having the anterior edge rounded, the posterior one straight and often with 1 or 2 short teeth at the outer distal corner; stipe, rachis, and costae beneath rather sparsely crinite by reddish-brown or blackish, entire or very sparsely fimbriate scales.

Malaya, Ceylon, southern India, Siam.

Dryopteris hirtipes var. **atrata** (Wall.) C. Chr.

Aspidium atratum Wall.; Kunze, Linnaea **24**: 279. 1851 (in part?).

Pinnae mostly sessile, not close, 2 cm. broad or less, the obliquely truncate base diverging from the rachis; margins serrulate (incisures only 2 to 3 mm. deep), the lobes broader than long, truncate and often slightly emarginate, with a distal tooth; scales of stipe and rachis mostly very dense, linear, black or blackish, sometimes distinctly fimbriate, those of the costae beneath often reddish.

Common in Indian Himalaya, also in southern China (e. g. Kweichou, *Cavalerie* 2847).

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Peng Sai (2207).

YUNNAN: Between Tengyueh and the Burmese border (7336, 7338).

A form of this variety, described as *Aspidium pycnopteroides* Christ,[8] occurs in western Szechwan (*Wilson* 5401! *H. Smith* 2066, 2103!). It differs from typical *atrata* chiefly in the broader, light brown scales of the rachis.

[8] Bull. Acad. Géogr. Bot. **16**: 116. 1906.

Dryopteris hirtipes var. stenolepis (Baker) C. Chr.

Polypodium (Goniopteris) *stenolepis* Baker, Kew Bull. Misc. Inf. **1898**: 231. 1898.

Aspidium yunnanense Christ, Bull. Herb. Boiss. **6**: 965. 1898.

Nephrodium gamblei Hope, Journ. Bombay Nat. Hist. Soc. **12**: 533. *pl.* 7. 1899.

Dryopteris gamblei C. Chr. Ind. Fil. 267. 1905.

Dryopteris stenolepis C. Chr. Ind. Fil. 294. 1905.

Very like var. *atrata*, with the stipe and rachis densely crinite with nearly black linear scales, but tolerably well marked by the narrower (1 to 1.5 cm. broad), numerous, and densely placed pinnae, these strictly sessile, with the truncate base closely parallel to the rachis and sometimes overlapping it; stipe bases and apex of the strong erect rhizome covered with a dense mass of large ovate-lanceolate scales, these fuscous in some specimens, in others light brown and glossy, those of the stipe above its base always nearly black.

This is the commonest form in Yunnan. I have little doubt that the Himalayan *Nephrodium gamblei* Hope is identical with *Polypodium stenolepis* Baker, and Hope himself (?) has noted their identity on the type sheet of the latter (*Henry* 9038; Kew!), which Baker referred to the subgenus *Goniopteris* of *Polypodium*, although the veins are free.

YUNNAN: Between Tengyueh and Lungling (7214, 7220). East of Tengyueh (7854).

BURMA: Kambaiti Valley (7507).

A form of this variety with the pinnae lobed halfway down to the midrib is *Aspidium lunanense* Christ[9] (Henry 10584!). Also the Japanese *Dryopteris dickinsii* (Franch. & Sav.) C. Chr. seems to be a form of *D. hirtipes* closely allied to the plant described as *A. pycnopteroides* Christ, mentioned above.

Intimately related to *D. hirtipes* is *Dryopteris thibetica* (Franch.) C. Chr., with which *Nephrodium microlepis* Baker, from Yunnan (Henry 13154; Kew!), is almost identical. It differs from all forms of *hirtipes* in the reddish, crisped, linear scales of the rachis, in having the pinnae incised midway to the midrib into triangular-oblong, subobtuse, subdentate lobes with cartilaginous teeth (the middle segments often a little enlarged), and in having the midveins of the lobes curved backward more strongly at base. In cutting, *Nephrodium microlepis* is exactly like the type from Mupin (leg. *David!*), but the venation is slightly different, the edges are less cartilaginous, and the sori are closer to the midrib.

I may mention here also *Dryopteris peregrina* C. Chr.,[10] which I had formerly supposed to be a near relative of *D. thibetica*. It was described from a sterile specimen collected in Kiu Kiang, by Shearer. An examination of the type specimen at Kew has shown, however, that it is only a sterile leaf of *Matteuccia orientalis*.

Dryopteris clarkei (Baker) Kuntze.

BURMA: Between Sadon and the Yunnan border, altitude 2,700 meters (7405).

Blade long-attenuate below, in general aspect very similar to the form mentioned by me recently[11] under the name *D. filix-mas* subsp. *fibrillosa* (Clarke) C. Chr., which I now consider a distinct species. *Dryopteris clarkei* is more closely related to *D. apiciflora*, however, than to the form just mentioned, and is especially well marked by the rectangular truncate segments, these

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[9] Bull. Herb. Boiss. **6**: 966. 1898.

[10] Ind. Fil. 284. 1905 (*Nephrodium regulare* Baker, Journ. Bot. Brit. & For. **13**: 200. 1875).

[11] Medd. Bot. Trädg. Göteborg **1**: 57–59. 1924.

not toothed, but bordered by a rather broad hyaline margin, and not fibrillose beneath; costa above straight, very slightly or not at all furrowed. The species is illustrated rather well by Beddome (Ferns Brit. Ind. Suppl. *pl. 371*).

Dryopteris apiciflora (Wall.) Kuntze.

YUNNAN: East of Tengyueh, in dense forest; altitude 2,400 meters (7603).

In size, color, and scaly stipe and rachis the present plant is scarcely different from *D. paleacea*, yet I consider it a distinct species. It is fully bipinnate; secondary pinnules not so close as in *D. paleacea*, adnate and short-decurrent at the posterior base, excised at the anterior one; margins entire or repand, the apex truncate or a little attenuated, crenately dentate, not sharply serrate as in *D. paleacea;* sori mostly confined to the outer third of the pinnules; indusia peltate, with a very low sinus; costae above straight, very narrowly sulcate or not, rather fibrillose with rufous scales.

This species has recently been found in Formosa, but is new to China.

Dryopteris paleacea (Swartz) C. Chr. Amer. Fern Journ. 1: 94. 1911.

Aspidium paleaceum Swartz, Syn. Fil. 52. 1806 (type from Andes); D. Don. Prodr. Fl. Nepal. 4. 1825 (type from Himalaya).

Dryopteris filix-mas * *A. paleaceum* Swartz and * *A. patentissimum* Wall.; C. Chr. Ind. Fil. 265. 1905, with synonyms (*Nephrodium filix-mas* var. *fibrillosa* Clarke excepted).

YUNNAN: West of Talifu, Shia Shiu Chi, altitude 2,400 meters (6896). From Pingpo to Tengyueh, Salween Ridge (7009). Between Tengyueh and the Burmese border (7354).

BURMA: Between Sadon and the Yunnan border (7506).

I have formerly considered the American *Aspidium paleaceum* Swartz (*A. parallelogrammum* Kunze) and the Himalayan *A. paleaceum* Don (*A. patentissimum* Wall.) specifically different, but a close comparison of the very complete specimens gathered by Mr. Rock with equally beautiful specimens received in recent years from America has shown me that it is impossible to find one stable character by which they can be distinguished. On the other hand, this tropical species can not be united at all naturally with our northern *D. filix-mas*. Although a much larger fern—the leaves are sometimes as much as 1.5 meters long—it is less incised, with very uniform closely placed secondary segments, these broadly adnate and widened at both sides of the base, the parallel edges entire, the truncate apex sharply serrate. The mature indusia are biscutelloid,[12] i. e. cleft into two equal halves, exactly as in the American form. The stipe and rachis are very densely paleaceous, with patent lanceolate-linear, reddish brown or (rarely) blackish scales; the costae are flexuose above and broadly sulcate, the furrow with raised pale edges and deciduous hairlike fibrils.

Under this species I recognize provisionally the following variety:

Dryopteris paleacea var. **khasiana** (Clarke) C. Chr.

Nephrodium filix-mas var. *khasiana* Clarke, Trans. Linn. Soc. II. Bot. 1: 519. *pl. 69, f. 1.* 1880.

YUNNAN: Between Tengyueh and the Burmese border (7285). Between Kambaiti and Tengyueh near Tako (7540).

SOUTHEASTERN TIBET: Mount Kenyichunpo (11628, doubtful).

Differs from the typical form of the species in its lesser size, in having the blade not narrowed below, in the hairlike, nearly black fibrils of the

[12] Fée, Gen. Fil. *pl. 23 B, f. 1.*

stipe and rachis, in its segments being more oblique, short-acute, and sharply toothed both at the tip and below it, and in its smaller sori. It is probably a valid species, near *D. odontoloma*.

Dryopteris odontoloma (Moore) C. Chr. Medd. Bot. Trädg. Göteborg **1**: 59. 1924.

Dryopteris filix-mas **Lastrea odontoloma* Moore; C. Chr. Ind. Fil. 265. 1905, with synonymy.

Dryopteris juxtaposita Christ, Bull. Acad. Géogr. Bot. **17**: 138. 1907.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 2,700 meters elevation (3607, 3812, 5996).

Dryopteris chrysocoma (Christ) C. Chr. Ind. Fil. 257. 1905.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,000 meters elevation (5611). Summit of Shweli-Salween Ridge, east of Tengyueh, in dense forest (7726).

This is likely a high-alpine, scaly, glandulose-pubescent form of *D. cochleata*.

Dryopteris cochleata (D. Don) C. Chr. Ind. Fil. 258. 1905.

BURMA: Keng Tung Territory: Dry plains, between Pang Hoi Hpi and Peng Sai (2245); Meh Lui watershed (2285).

YUNNAN: Between Tengyueh and the Burmese border (7279). East of Tengyueh (7679). Between Tengyueh and Bhamo (7828).

Often decidedly dimorphic, the fertile pinnules much contracted.

Chinese specimens which I refer here have been named, by Merrill, *D. heleopteroides* Christ, a species from Luzon, unknown to me. May it be the same as *D. cochleata*?

Dryopteris sublacera Christ, Not. Syst. Lecomte **1**: 43. 1909; C. Chr. Medd. Bot. Trädg. Göteborg **1**: 60. 1924.

Dryopteris blepharolepis C. Chr. in Léveillé, Cat. Pl. Yun-Nan 103. 1916.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,150 meters elevation, in gulch, under *Abies* (5889).

Dryopteris fructuosa (Christ) C. Chr. Ind. Fil. 267. 1905; Med. Bot. Trädg. Göteborg **1**: 61. 1924.

Aspidium varium var. *fructuosum* Christ, Bull. Herb. Boiss. **6**: 967. 1898.

Aspidium fructuosum Christ, Bull. Soc. Bot. France **52**: Mém. **1**: 38. 1905.

Dryopteris basisora Christ, Not. Syst. Lecomte **1**: 44. 1909.

Dryopteris cavalerii Léveillé; C. Chr. in Léveillé, Cat. Pl. Yun-Nan 104. 1916.

Dryopteris adenorachis C. Chr. Ind. Fil. Suppl. Prél. 1913–1916, 13. 1917.

YUNNAN: West of Talifu, en route to Youngchang and Tengyueh (6649, 6921, 7033a). East of Tengyueh (7612, 7733, 7862).

This species varies considerably in degree of cutting. The largest specimens have the pinnules deeply pinnatifid, whereas others (e. g., nos. 6649 and 7033a) are bipinnate only, with subentire, oblong, obtuse, subhastate pinnules, thus in cutting scarcely different from *D. sublacera*. The latter species differs, however, in its lanceolate (not deltoid) blades and in its distinctly fimbriate rachis scales. I suppose that the *Nephrodium rigidum* of Clarke and Beddome is this species.

Dryopteris marginata (Wall.) Christ, Philippine Journ. Sci. Bot. **2**: 212. 1907.

Dryopteris filix-mas **Aspidium marginatum* Wall.; C. Chr. Ind. Fil. 265. 1905, with synonyms.

BURMA: Between Sadon and the Yunnan border (7504).

YUNNAN: Between Hsiaó Chai and summit of Shweli-Salween ridge, in forest, at 2,100 meters elevation (7620).

Dryopteris barbigera (Moore) Kuntze.

YUNNAN: Alpine heights of the Likiang Snow Range, altitude about 3,900 meters (4968). Among undergrowth in *Acer* forest, mountains above Tseku and Tsehchung, altitude 3,300 meters (11604).

Dryopteris erythrosora (D. C. Eaton) Kuntze.

YUNNAN: Between Szeamo and Puerhfu (2852).

According to description, *D. subtriangularis* (Hope) C. Chr. seems to be a form of this species. It is best known by the bullate scales of the costae beneath.

Dryopteris sparsa (D. Don) Kuntze.

YUNNAN: Between Keng Hung and Muang Hing (2721).

BURMA: Between Sadon and the Yunnan border (7503).

Dryopteris sikkimensis (Bedd.) Kuntze.

YUNNAN: East of Tengyueh, Shweli-Salween watershed, in dense forest; altitude 2,400 meters (7597, 7601).

This beautiful fern was hitherto known from Sikkim only. The stipe and lower part of the rachis of no. 7597 are atropurpureous, as in *D. splendens*.

Subgenus POLYSTICHOPSIS

Dryopteris speciosa (D. Don) C. Chr. Medd. Bot. Trädg. Göteborg **1**: 63. 1924.

Polystichum speciosum J. Smith; C. Chr. Ind. Fil. 587. 1906, with synonymy

YUNNAN: Between Tengyueh and the Burmese border (7371).

The plant here cited represents a less divided form of the species, with broad pinnules.

Dryopteris speciosa var. **assamica** (Kuhn) C. Chr.

Aspidium assamicum Kuhn, Linnaea **36**: 108. 1869.

BURMA: Keng Tung Territory, Valley of the Meh Len (2186).

A larger and more divided plant, which I identify from Kuhn's description. It is bipinnate-pinnatifid, the lower pinnae 30 cm. long and equal-sided, the pinnules 4 cm. long, and very unequal at base.

Dryopteris aristata (Forst.) Kuntze.

Polystichum aristatum Presl; C. Chr. Ind. Fil. 578. 1906, with direct synonyms (most, if not all, varieties excluded).

YUNNAN: Between Keng Hung and Muang Hing (2718).

Dryopteris carvifolia (Kunze) C. Chr. Medd. Bot. Trädg. Göteborg **1**: 64. 1924.

Polystichum carvifolium C. Chr. Ind. Fil. 580. 1906 (excl. syn. *A. coniifolium* Wall.).

YUNNAN: Between Muang Hun and Muang Hai (2411).

See the comments under the following species.

Dryopteris henryi (Christ) C. Chr.

Polystichum henryi Christ, Not. Syst. Lecomte **1**: 36. 1909.

Aspidium coniifolium Wall. 1828 (nomen); Kunze, Linnaea **24**: 293. 1851, not Presl, 1822.

Polystichum carvifolium C. Chr. Ind. Fil. 580. 1906, in part.

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Pang Sai (2233).

YUNNAN: Between Tengyueh and the Burmese border (7337).

I agree with Christ that this is so distinct a form that it must be considered specifically different from *D. carvifolia*. In sorting out the rather numerous specimens in the Botanical Museum of Copenhagen sent a century ago from our countryman, N. Wallich, to Professor Hornemann I find that they evidently

belong to two different forms, and that only one is named *A. coniifolium* Wall., i. e., the name received from Wallich. Furthermore, I find that Kunze in 1851 clearly pointed out the differences between these same two forms, which were described by him as *A. carvifolium* Kunze and *A. contifolium* Wall. (loc. cit. 292–293). Mettenius, in his paper on *Aspidium* and *Phegopteris*, made *coniifolium* a variety of *carvifolium;* but later on both were either referred to *A. aristatum* as much-divided varieties, e. g. by Clarke (Review, p. 511), or were merged together into one species, *coniifolium* (e. g., Beddome, Handbook, p. 230). Beddome's character, "sori large or small," seems clearly to show that he knew both forms. As indicated above, I regard them without question as specifically different, and shall here point out some of their distinguishing characters.

Dryopteris carvifolia is smaller than the other, coriaceous and shining, pale green beneath, and three to four times pinnate; sori with rather large, persistent, subreniform, pale brown indusia; scales of stipe many, of rachis few, all narrowly lanceolate and distinctly toothed. *Dryopteris henryi* is a much larger species, the blades thin, nearly herbaceous, scarcely paler below, and four to five times pinnate with basal pinnae 40 cm. long or more; sori smaller, with the less persistent brown indusia nearly always abraded in herbarium specimens; scales of stipe many, of rachis almost none, entire. There are, besides, other differences—for example, in the shape of the ultimate segments and teeth. In habit *Dryopteris henryi* is not unlike *D. effusa* (Swartz) Urban, of tropical America.

Dryopteris fargesii (Christ) C. Chr. var.? PLATE 15

YUNNAN: West of the Mekong, from Pingpo to Tengyueh (7029). East of Tengyueh (7645).

The present specimens apparently differ from the form described by Christ (*Farges* 299!) in lacking scales on the rachis and costules beneath, but a close examination shows that a few minute scales actually occur on the costules; in *D. fargesii* more numerous, distinctly bullate scales are found. It is highly probable that this decompound fern of southern China is a form of the Japanese *D. miqueliana* (Franch. & Sav.) C. Chr. In size, cutting, and texture it fully agrees with that species, differing chiefly in the fewer scales of stipe and rachis, in its light green color, and in having not only the costules but also the costae of the pinnae hirsute above; in the type, ovate-bullate scales are found on the costules beneath, just as in *D. fargesii.*

I am inclined to believe, therefore, that *D. fargesii* (typical) is a slightly different form of *D. miqueliana*, and that the specimens under examination, with which others from Yunnan (*Cavalerie* 4726 in part) fully agree, represent a less scaly variety of the same species. *Dryopteris miqueliana* and *D. fargesii* belong to a small group of decompound plants, including, for example, *D. diffracta* (Baker) C. Chr., which can not be placed very naturally under any of the subgenera characterized in my papers on the American species of *Dryopteris.*

EXPLANATION OF PLATE 15.—*Dryopteris fargesii*, from region east of Tengyueh, Yunnan, *Rock* 7645. Second pinna from base of blade. Two-thirds natural size.

POLYSTICHUM Roth

Polystichum deltodon (Baker) Diels.

YUNNAN: Ta Ho Shan, western slopes of the Likiang Snow Range, at 3,600 to 3,900 meters elevation (4238).

Polystichum stenophyllum Christ. PLATE 16

YUNNAN: Lachiming Valley; altitude 2,400 meters; on shady banks in bamboo forest (8627).

EXPLANATION OF PLATE 16.—*Polystichum stenophyllum; Rock* 8627. Two-fifths natural size.

Polystichum obliquum (D. Don) Moore.

YUNNAN: Lower eastern slope of the Likiang Snow Range, at 2,700 meters altitude, in a limestone cave (3606).

Polystichum nepalense (Spreng.) C. Chr.

YUNNAN: Tsangshan Range, at 2,700 meters elevation, in a cave (3159). East of Tengyueh (7606, 7616).

Most distinct in the peculiar teeth and scales of the underside. The typical form is pinnate, with broad, falcate, short-acuminate pinnae that are distinctly auricled at the upper base, the margins white-callose and slightly serrate with irregular, straw-colored, broad teeth, which are not pungent. The under side is rather densely dotted on the veins with minute appressed scales, these nearly circular at base, often pale, and with a long-cuspidate reddish apex. The rachis is rather sparsely clothed with smaller cuspidate scales and with a number of large, ovate, light brown ones, the latter generally placed at the base of the pinnae and along the very long stipe.

Aspidium manmeiense Christ,[18] is, according to Christ himself, a form of this species with the auricle of the lower pinnae free. It thus connects the type with the following variety:

Polystichum nepalense var. **subbipinnatum** C. Chr., var. nov.

YUNNAN: East of Tengyueh, between Hsiao Chai and the summit of the Shweli-Salween ridge, altitude 2,400 meters, on shaded mossy rocks (7605).

Pinnae deeply pinnatifid, with 4 or 5 ovate segments on each side below the broad serrate apex, the upper basal one large and free in the lower pinnae.

In cutting the new variety resembles very closely certain forms of *P. lobatum*, but the white teeth and the scales of the underside are exactly as in typical *P. nepalense* and prove that it is a more divided form of that species.

GROUP OF POLYSTICHUM SQUARROSUM

To this small group belongs an unbroken series of forms varying from simply pinnate to bipinnate. The group is exceedingly well marked by the hard, very coriaceous texture and glossy surfaces; by the thickened margins, which bear a few strong spines; by the fact that the rhizome and rachis, and usually also the underside, are densely beset with reddish scales, those of the rhizome and stipe very large and leaving characteristic transverse, linear, black or reddish scars (less distinct in the small forms), those of the underside consisting of a small central portion with 1 to 5 very long, reddish, hairlike, tortuous or crisped fibrils. The latter scales are, indeed, sometimes so numerous at first that the underside appears woolly, but in old fronds they are generally abraded. The scales of the rachis and costae beneath are of different sizes, varying from hairlike to lanceolate; they are generally reddish, though rarely (in some forms of *P. neolobatum*) blackish. The sori are, as a rule, nearer the midrib than the edge.

Taken as a whole, the group is easily distinguishable from others; but it is more difficult to delimit the few species comprising it, since they are almost completely connected by intermediates. Nevertheless I think it is possible to recognize the following species:

[18] Bull. Herb. Boiss. 6: 965. 1898 (*Henry* 10097).

Polystichum stimulans Presl, Tent. Pter. 83. 1836.

Aspidium stimulans Kunze; Mett. Abh. Senckenb. Ges. Frankfurt **2**: 327. 1858.

Aspidium ilicifolium D. Don, Prodr. Fl. Nepal. 3. 1825.

Polystichum ilicifolium Moore, Ind. Fil. 94. 1858, not Fée, 1852.

YUNNAN: Tsangshan Range, altitude 2,700 meters, in a cave (3159a). Eastern slopes of the Likiang Snow Range (3688).

This is the smallest form, with blades 2.5 to 5 cm. broad (rarely more), generally somewhat narrowed downward, simply pinnate to pinnate-pinnatifid, the large scales shortly erose-fimbriate or dentate. The least divided form is typical *P. stimulans*, from the Himalaya. It is simply pinnate, the pinnae triangular, rather remote, 1 to 1.5 cm. long, with a pungent lobe on each side of the base (the upper one the larger and sometimes nearly free) and above these often 1 or 2 shorter lobes; veins obscure; linear scars on stipe few or none.

Similar simply pinnate forms from southern China were described as *P. ilicifolium* var. *delavayi* Christ;[14] they differ a little in their more crowded pinnae, and are transitional to the following species.

Polystichum acanthophyllum (Franch.) Bedd.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,300 to 4,200 meters elevation (3435, 3814).

Larger than the preceding. Blades 20 to 25 cm. long, 4 to 5 cm. wide, narrowed below, the pinnae imbricate, deeply pinnatifid, with 4 or 5 ovate segments, each with 3 or 4 pungent or mucronate teeth, the upper basal one larger and often quite free; veins distinct beneath; linear scars on stipes many.

The typical form of this species looks very distinct, but is possibly no more than a large state of *P. stimulans*. On the other hand the form named by Christ *P. acanthophyllum* var. *indicum*[15] and illustrated by Hope[16] connects the type with *P. squarrosum;* it is subbipinnate, with nonimbricate pinnae, these with 5 or 6 segments which have pungent tips but are generally without lateral teeth, the lower 2 or 3 free. This form could as well be considered a narrow state of *P. squarrosum.*

Polystichum cyclolobum C. Chr. in Léveillé, Cat. Pl. Yun-Nan 111. 1916.

YUNNAN (*Maire* 122).

Differs from *P. acanthophyllum*, which it equals in size, by the lamina being broadest at base and tapering gradually thence toward the apex, by the long-fimbriate scales, and by the short-ovate or nearly circular segments or pinnules, which are pungent at the tip only, rarely with a single tooth on the distal edge. It may be a small form of the following:

Polystichum neo-lobatum Nakai, Bot. Mag. Tokyo **39**: 118. 1925.

Polystichum lobatum var. *chinense* Christ, Nuov. Giorn. Bot. Ital. n. ser. **4**: 92. 1897.

Polystichum squarrosum var. *chinense* C. Chr. Medd. Bot. Trädg. Göteborg **1**: 69. 1924.

YUNNAN: High plateau, between Talifu and Likiang, in a rocky gorge (3300).

In size and cutting greatly resembling typical *P. lobatum*, but much more coriaceous. Blades 10 to 12 cm. broad, subbipinnate; pinnae not imbricate, often rather distant, short-acuminate, pinnate in the lower half; pinnules ovate-acuminate, very close, the larger with 1 to 3 lateral pungent teeth, the upper

[14] Mém. Soc. Bot. France **1**: 31. 1905.

[15] Mém. Soc. Bot. France **1**: 31. 1905.

[16] Journ. Bombay Nat. Hist. Soc. **14**: *pl. 29.*

basal one enlarged, sublobate; narrow scales of stipe and rachis often dark colored, the larger ones of the stipe erose-dentate, leaving distinct linear, raised scars when falling.

Polystichum squarrosum (D. Don) Fée.

Polystichum lobatum var. 4. C. Chr. Ind. Fil. 583. 1906, with synonyms.

The largest form of the group: Blades fully bipinnate; pinnae often 10 to 12 cm. long, with numerous free pinnules, these resembling the pinnae of *P. stimulans*, strongly auricled at distal base, lateral teeth 1 to 3 or often none; stipe and rachis quite hidden by reddish scales, those of the stipe very large, erose-dentate or sometimes entire, those of the rachis crisped, hairlike from a broad, lacerate base.

Himalaya.

Polystichum discretum (D. Don) Diels.

Polystichum lobatum var. 3. C. Chr. Ind. Fil. 583. 1906, with synonyms (excl. *Aspidium polyblepharon* Roem.).

Polystichum aculeatum var. *setulosa* Rosenst. Repert. Sp. Nov. Fedde 13: 141. 1914.

YUNNAN: Between Hsia Chai and summit of Shweli-Salween Ridge, along water course in dense forest, altitude 2,400 meters (7602).

A most distinct species: Blades rather coriaceous, nearly 1 meter long, lanceolate, somewhat narrowed below, fully bipinnate; pinnae close, 1 to 1.5 cm. broad, very regularly pinnate; pinnules uniform, narrowly rhombic-oblong, almost entire, with 6 to 8 very long spinescent teeth; both surfaces with long red hairlike fibrils, these protuding far beyond the margins; sori small, inframedial; stipe and rachis densely scaly, the scales partly hairlike, partly very large, ovate, thin, and reddish, or some of the stipe scales nearly black.

GROUP OF POLYSTICHUM ACULEATUM

This group, which includes *P. aculeatum*, *P. lobatum*, *P. braunii*, and other species adopted in my Index, is represented from the Himalaya eastward, as in other mountainous regions of the globe, by a large number of more or less distinct forms or species. Clarke and Beddome referred them all to a single species, *P. aculeatum*, but this treatment is unsatisfactory. In recent times Christ and other pteridologists have described a number of species and varieties from this region, some of which seem to me distinct; but certain of these have probably been described before and the nomenclature is, therefore, very complicated. Mr. Rock has gathered a fair number of specimens belonging to this group, and I shall try therefore to give a short review of the forms occurring in Yunnan and adjacent regions as represented in the present collection and in my own herbarium.

Polystichum moupinense (Franch.) Bedd.

YUNNAN: Alpine eastern slopes of the Likiang Snow Range, at 4,650 meters elevation (6115).

Polystichum yunnanense Christ, Not. Syst. Lecomte 1: 34. 1909.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 2,700 meters elevation (4289). West of Talifu; altitude 2,250 meters (6856). Valley of Meng Ka (7369). East of Tengyueh, Shweli-Salween ridge (7623, 7728).

BURMA: Between Sadon and the Yunnan border (7521).

In texture, cutting, and size this species resembles the typical European *P. setiferum* (Forsk.) Woynar (*Aspidium angulare* Kit., or "*Polystichum aculeatum*" of my Index Filicum), and could rather naturally be regarded as a geographical race of it. The most important differential characters are:

Rhizome scales very large, ovate-acuminate, glossy, almost black, with broader or narrower, scariose, light brown, entire margins; stipe and rachis with large, light brown, entire or sparsely fimbriate scales and numerous narrow fibrils, the latter reddish-brown or sometimes dark brown, long, hairlike, flexuose, sparsely fimbriate, their broad base appressed and fimbrate; similar scales on costae and costules beneath. Blade not or very slightly attenuate downward, the basal pair of pinnae often reflexed; pinnules more or less deeply serrate, the teeth dense, long-aristate. Blade fertile from base to apex, or the upper part sterile.

This species is common in the Himalaya and was referred by Clarke to his "*aculeatum*" type, which also includes forms that are scarcely distinguishable from *P. setiferum*. His variety *semifertilis* (Review, p. 509) is, according to scale characters, a large form of *P. yunnanense* with the upper third of the frond sterile, the rest densely fertile, with confluent sori. Other forms of *P. yunnanense* are:

Polystichum yunnanense var. **fargesii** (Christ) C. Chr.

Polystichum aculeatum var. *fargesii* Christ, Mém. Soc. Bot. France 1: 29. 1905.

Stipe and lower part of rachis with glossy, nearly black scales (with light brown fimbriate margins) intermixed with narrower reddish-brown scales and fibrils.

Yunnan; Szechwan (*H. Smith* 2385, 4922); Kweichou (*Cavalerie*).

Polystichum yunnanense var. **submuticum** C. Chr., var. nov.

Scales as in the type; blade rather coriaceous, suddenly contracted upward into a pinnate apex, the lower 2 or 3 pairs of pinnae sterile (unlike var. *semifertilis* Clarke); margins of pinnules often subentire, or slightly serrate with acute teeth, the apex and basal auricle short-aristate only.

YUNNAN: Top of Salween Ridge, altitude 2,400 meters, in forest (7033, 7035, 7737).

Polystichum sp.

YUNNAN: Between Tengyueh and the Burmese border, beyond Hpun Kan (7331).

A very large form with fronds (including stipe) 1.5 m. long and 45 cm. broad, in scale characters not essentially different from *P. yunnanense;* pinnules 2.5 cm. long, deeply serrately lobed and strongly auricled, the basal upper ones greatly elongate; sori costular.

I prefer to let this form remain unnamed, although it seems distinct enough. It stands in the same relation to *P. yunnanense* as the south European var. *hastulatum* (Tenore) to typical *P. setiferum*.

Polystichum biaristatum (Blume) Moore.

Polystichum aculeatum var. 30, C. Chr. Ind. Fil. 577. 1906.

BURMA: Keng Tung Territory: Bank of the Meh Len (2116, 2117); Meh Lui watershed (2309).

YUNNAN: Along Nam Ho (2476). Bank of Nam Meh (2713). Between Szemao and Puerhfu (2853). Between Tengyueh and Lungling (7099, 7138, 7171?). East of Tengyueh (7695, 7856).

This is the most common "*aculeatum*" form in the region of Assam, Upper Burma, and Yunnan. Clarke (Review, p. 510) has identified it with the Javanese *Aspidium biaristatum* Blume. As it agrees excellently with the description of that species in Van Alderwerelt van Rosenburgh's "Handbook" of Malayan ferns and with a form from Java described as *P. aculeatum* var. *eurylobum* Rosenstock,[17] which presumably is precisely *A. biaristatum*, I prefer to use that specific name.

[17] Repert. Sp. Nov. Fedde 8: 164. 1910.

The form under examination is a much larger fern than *P. yunnanense*, with which it has the large, glossy, black, scariose-edged rhizome scales in common; but the scales of the stipe and rachis are different, larger ones being few or none and the narrow hairlike fibrils generally black with a broad, light brown, thin, appressed base (soon abraded). Other characters are: Blade green, not reddish, subcoriaceous or papyraceous, the rachis often gemmiferous somewhat below the apex; pinnules numerous, often 2 cm. long or more, 5 to 7 mm. wide, trapezoid-oblong, often falcate, short-auricled at the distal base; margins subentire or dentate, the teeth shortly aristate or merely acute, the apex aristate; sori as a rule supramedial, lower pinnae most often sterile.

No. 7171 is referred here with doubt. In size and cutting the two specimens examined resemble very closely *P. nepalense* var. *subbipinnatum*, but the rachis is gemmiferous and the teeth and scales are widely different from that. The specimens are sterile, and I think they are young, less cut plants of *P. biaristatum*.

Polystichum punctiferum C. Chr., sp. nov. PLATE 17

Rhizome stout, oblique. Stipe strong, 45 cm. long, stramineous, at base densely clothed with large, glossy brown, concolorous, ovate, entire scales, upward with dense but easily abraded small ovate hair-pointed rufous ones. Blade about 50 cm. long, 25 cm. broad below the middle, broadly lanceolate, coriaceous, distinctly reddish when dried (especially above), bipinnate; rachis rather densely paleaceous with rufous lanceolate entire scales; pinnae about 15 pairs, alternate, the lower ones short-petiolate, lanceolate, finely acuminate, the basal ones equal to the others or slightly shorter; largest pinnae 15 cm. long by 3 cm. wide, pinnate nearly to the serrate apex; pinnules not contiguous, oblique, short petiolate or sessile, cuneate at the lower base, truncate and auriculate-lobate above, thence serrately lobed and attenuate toward the acute apex, the lobes numerous, close, oblique, with short-aristate or merely acute teeth; veins subpinnate in the lower (larger) lobes, furcate in the upper teeth, terminating well within the edge, the tips marked on the upper side of the blade by very distinct, brown, clavate or oblong hydathodes sunk in a little groove; sori medial or slightly inframedial; indusia small, deciduous, peltate, glabrous. Upper surface of the blade naked and glabrous throughout, the underside with numerous reddish-yellow hairlike fibrils on the costae and veins.

BURMA: Between Sadon and the Yunnan border, in forest, near Kambaiti (7522, type).

YUNNAN: Between Tengyueh and the Burmese border (7342).

This is a puzzling fern, very much resembling *P. biaristatum* in size and cutting, but nevertheless a most distinct new species, especially well marked by the obviously thickened tips of the veins. This feature is not found in any other species of *Polystichum* known to me, though it does occur in certain species of *Eudryopteris*, for example in *D. sparsa* and form of *D. erythrosora*, which also resemble the present plant in color. Nevertheless, the subaristate teeth and peltate indusia make it desirable to place the new species in *Polystichum*.

EXPLANATION OF PLATE 17.—*Polystichum punctiferum*. The type specimen, *Rock* 7522. About one-half natural size.

Polystichum (?) foeniculaceum (Hook.) J. Smith.

YUNNAN: East of Tengyueh, in shade, on moss-covered banks; altitude 2,400 meters (7604).

A very beautiful fern, of doubtful systematic position. It is, however, more natural to place it under *Polystichum* than under *Diacalpe*, as proposed by Clarke. In a rather young specimen from the Himalaya the red indusia are seen to be peltate but fixed excentrically; when forced back by the sporangia the indusium seems attached laterally to the receptacle, and appears as a scale, entire or cleft, on the distal side of the receptacle, as in the beautiful specimens from Yunnan. In this state the indusia do not at all resemble those of *Polystichum*, and the natural place of the species is scarcely here but rather in a genus of its own.

The species is new to China.

CYRTOMIUM Presl

Cyrtomium caryotideum (Wall.) Presl.

Polystichum falcatum **Aspidium caryotideum* Wall.; C. Chr. Ind. Fil. 581. 1906.

NORTHWESTERN YUNNAN: Mountains of Londjre. Mekong-Salween watershed (8902). Mountains above Tsehchung, along the Meh Kong (11599).

Cyrtomium hookerianum (Presl) C. Chr. Amer. Fern Journ. **20**: 44. 1930.

Lastrea hookeriana Presl, Tent. Pter. 77, 1836.

Aspidium caducum Wall.; Hook. & Grev. Icon. Fil. **2**: *pl. 171.* 1829. Not H. B. K. 1815.

YUNNAN: Between Tengyueh and the Burmese border, in mossy forest, near Hpunkan (7341, 7357).

TECTARIA Cav.

Tectaria vasta (Blume) Copel.

BURMA: Keng Tung Territory: Between the Siamese border and Pang Mah Ki Hat (1938, 1957); Valley of the Meh Len (2132, 2139).

YUNNAN: Along the banks of the Meh Kong, near Keng Hung (2517a).

In several of these specimens scaly buds are found in the axils of the rachis and costules. The species is new to China.

Tectaria decurrens (Presl) Copel.

YUNNAN: Banks of the Meh Kong, near Keng Hung (2517).

Tectaria polymorpha (Wall.) Copel.

BURMA: Keng Tung Territory: Between the Siamese border, Ban Meh Huak, and Pang Mah Ki Hat (1954); Valley of the Meh Len (2084, 2090, 2093, 2094, 2130, 2182, 2187); Meh Lui watershed (2283).

YUNNAN: Between Keng Hung and Muang Hing (2571, 2572, 2575, 2576, 2597, 2598, 2637, 2638).

As the name indicates, this is a very variable species and the specimens referred here look very different. Some from the Meh Len Valley (nos. 2084, 2090, 2094, 2130), which I consider to be young fertile plants, have the leaves either entire with a deeply cordate base, or trilobate with a pair of smaller basal lobes; these agree very well with the type of *Nephrodium morsei* Baker[18] from Kwangsi (Kew!). Some of the specimens from Yunnan have a distinctly creeping rhizome, glabrous costae, and the basal pinnae not forked, thus much resembling *Aspidium heterocarpum* Bedd. (Handbook, p. 219), but none of them have buds in the axils.

Tectaria variolosa (Wall.) C. Chr.

Aspidium variolosum Wall.; Hook. Sp. Fil. **4**: 51. 1862.

YUNNAN: Between Chieng Law and Muang Hun (2372).

Further synonymy is given in the Index Filicum (p. 97).

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[18] Kew Bull. Misc. Inf. **1906**: 11. 1906.

Tectaria fuscipes (Wall.) C. Chr.

Aspidium fuscipes Wall. List, no. 361. 1828, in part; Bedd. Ferns Brit. Ind. 15. *pl. 366.* 1876.

Nephrodium membranifolium Hook. Sp. Fil. 4: 131. *pl. 261.* 1862; Clarke, Trans. Linn. Soc. II. Bot. 1: 534. *pl. 75.* 1880. Not *N. membranifolium* Presl, 1825, which is *Dryopteris dissecta* (Forst.) Kuntze.

Aspidium subsageniaceum Christ, Bull. Acad. Géogr. Bot. 16: 240. 1906.

Dryopteris subsageniacea C. Chr. Ind. Fil. Suppl. 40. 1913.

BURMA: Between the Siamese border, Bam Meh Huak, and Pang Mah Ki Hat (1952, 1953).

YUNNAN: Along the banks of the Meh Kong, near Keng Hung (2551).

A reduced form of the group of *T. cicutaria.* Pinnae pinnatifid only, the lower segments of the basal ones generally elongate; veins of the upper pinnae free, with a forked vein running out from the costa midway between two costules, those of the lower (larger) pinnae partly anastomosing and forming costal areoles.

Aspidium subsageniaceum Christ is the normal condition of the species, and the same form occurs in Annam (*Cadiere* 94, 126). The latter material was named by Christ *Aspidium obscurum,*[19] identifying it with *Phegopteris obscura* Fée, which is closely related to *Dryopteris sagenioides* and perhaps a variety of it.

Closely related to *T. fuscipes* is **Tectaria austrosinensis** (Christ) C. Chr.,[20] from Kweichou (*Cavalerie* 2637; *Esquirol* 2237, 3733). The venation is essentially the same, although arching veins are rare; but this is a much larger species, with the distant pinnae 20 cm. long or more, 3 to 4 cm. broad, and incised two-thirds the way to the midrib into oblong-rounded repand lobes 8 mm. broad; basal pinnae not at all compound, rather a little reduced. Superficially *T. austrosinensis* closely resembles *Dryopteris lofouensis* in habit, but the pubescence (rusty intestiniform hairs on the costae above), scales, venation, and the pluriserial sori in the lobes show clearly that it belongs to the section *Pleocnemia* of *Tectaria.*

OLEANDRA Cav.

Oleandra cumingii var. **longipes** Hook. Sp. Fil. 4: 158. 1860.

BURMA: Keng Tung Territory: Ridge between Muang Len and Meh Kong (2026, 2026a).

A well-marked variety or, as I suspect, a valid species; stipes scattered, up to 20 cm. long, articulated at the middle, like the underside and indusia downy; rhizome scales entire or slightly villose-fimbriate; lamina cuneate at base, short-decurrent.

EGENOLFIA Schott

In 1904 I published a short paper on the American species of *Leptochilus,* Sect. *Bolbitis,*[21] wherein I used the name *Leptochilus* Kaulf. for the group of acrostichoid ferns generally called *Gymnopteris.* This usage was adopted in my Index Filicum also, and has since been followed by nearly all pteridologists. Aware of its heterogeneity, I divided the genus in four sections or subgenera (Ind. Fil. p. xxvi): *Euleptochilus, Anapausia, Bolbitis,* and *Lomagramma,* and, following Diels, placed it in the tribe Aspidieae. The last section, *Lomagramma,* was subsequently (Ind. Fil. Suppl. p. 49) separated from *Leptochilus*

[19] Journ. de Bot. 19: 62. 1905.

[20] *Dryopteris austrosinensis* Christ, Bull. Acad. Géogr. Bot. 17: 145. 1907.

[21] Bot. Tidsskr. 26: 283–297.

as a genus; the other three have until now remained in *Leptochilus*, although it must be evident to everyone that these three sections are only remotely related. This was shown by Eva Schumann,[22] who, after a comprehensive study of the comparative morphology of the group, came to the conclusion that, "Die Leptochilen mit geteilter Blattspreite sind von *Dryopteris* subgenus *Meniscium* abzuleiten, die mit ungeteilter Blattspreite wahrscheinlich von *Polypodium*-Arten" (p. 258). With this view Prof. F. O. Bower has agreed in his fundamental Studies in the Phylogeny of the Filicales,[23] and it is certainly correct, at least as to the second point. The species with simple fronds (*Leptochilus*, in the proper sense) are intimately related to certain species of *Polypodium* (for example, *P. ovatum*), and I now use the name *Leptochilus* for these species only and place this genus in the tribe Polypodieae.

The species with more or less divided leaves are less intimately related and the contention that they are derivates of *Meniscium* is only partly true, though the proper place of all seems to be in the tribe Dryopterideae (Aspidieae). My opinion is that the section *Anapausia*, the type species of which is the tropical American *L. alienus*, is derived from *Tectaria*, and it is possible also that certain Asiatic species, such as *L. diversifolius*, have their nearest relatives among the species of *Tectaria*.

The remaining group, known variously as *Poikilopteris* Eschweiler (1827), *Bolbitis* Schott (1834), *Poecilopteris* Presl (1836), *Cyrtogonium* J. Smith (1842), *Heteroneuron* Fée (1845), and *Gymnopteris* Beddome and others, includes a number of tropical species which are rather uniform as to most characters, though scarcely congeneric. In a recent paper[24] Copeland has given an elaborate review of all oriental species of this group, for which he has preferred the generic name *Campium* Prsl. I am inclined to consider the American species (*Poecilopteris* Presl, or *Bolbitis* Schott) generically different from the oriental ones and can therefore agree with Copeland in preferring the name *Campium* for the latter; but on the other hand I can not follow him in including in *Campium* the section *Dendroglossa* and some, or all, of the simple-fronded species of his section *Heteroneuron*, which in my opinion are polypodioid ferns with acrostichoid sori, while the pinnate species of *Heteroneuron* are acrostichoid derivates from the Dryopterideae. *Campium*, thus confined, is closely related to *Egenolfia* Schott (1834).

The genus *Egenolfia* was based on *Acrostichum appendiculatum* Willd. and was later united with *Polybotrya*, as in my Index Filicum. *Polybotrya* is, however, in its wider sense a most unnatural group of ferns, including species related to *Polystichum*, different subgenera of *Dryopteris* (e. g. *Ctenitis* and *Polystichopsis*), and other dryopteroid ferns. *Egenolfia* is now shown to be so closely related to certain Asiatic species of *Campium* that I am rather inclined to place the species of both in a single genus, which thus could be divided into two sections: *Egenolfia* with free veins, and *Campium* with anastomosing veins. For the present, however, I maintain the two genera.

Egenolfia appendiculata var. subintegra (Bedd.) C. Chr.

Polybotrya appendiculata var. *subintegra* Bedd. Handb. Ferns Brit. Ind. 427. 1883.

BURMA: Forests southeast of Mawlaik, Upper Chindwin District (823).

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[22] Die Acrosticheen und ihre Stellung im System der Farne. Flora 108: 201–260. 1915.

[23] See especially, Ann. Bot. 31: 1–39. 1917.

[24] *Leptochilus* and genera confused with it. Philippine Journ. Sci. Bot. 37: 333–416. 32 plates. 1928.

The specimens agree excellently with Beddome's short description and figure [25] of this variety, and probably represent a distinct species. The sterile blades are often elongate and gemmiferous at apex; the fertile pinnae are torulose.

Egenolfia helferiana (Kunze) C. Chr.

Polybotrya helferiana Kunze, Farrnkr. 2: 35. *pl. 114.* 1848.

LOWER BURMA: Oktada, Martaban Hills, Kalama Range (759).

Apparently a distinct species. The bipinnate fertile leaf, with very small, distant, beadlike pinnules, resembles that of *Psomiocarpa apiifolia* (Kunze) Presl.

CAMPIUM Presl

Campium sinense (Baker) C. Chr.

Acrostichum sinense Baker, Kew Bull. Misc. Inf. 1906: 14. 1906.

Polybotrya sinensis C. Chr. Ind. Fil. Suppl. 57. 1913.

Egenolfia sinensis Maxon, Proc. Biol. Soc. Washington 36: 173. 1923.

YUNNAN: Between Keng Hung and Muang Hing, along river banks (2636, 2657). Between Mohei and Maokai (2913).

This is closely related to the following species and especially to *C. cuspidatum* (Presl) Copel.,[26] resembling the latter in its dark green color and deeply lobed pinnae, differing in simpler venation and truncate base of the pinnae. The sterile leaves terminate often in a gemmiferous tail, and the lower basal segments of the basal pinnae are often prolonged as in some forms of *Egenolfia appendiculata.* The pinnae are broader and generally shorter than in *C. angustipinnum* and are incised nearly midway to the costa, with broad, oblique, obtuse, close, faintly repand lobes, with a distinct tooth in the narrow sinuses; these teeth, which often are double, were not observed by Baker ("setis inter lobos haud productis"), although they are very distinct in the type specimen (*Henry* 12494; Kew!). In this specimen all the veins are free, as they are in *Rock* 2657; in *Rock* 2913 one finds, however, here and there an arching vein between two costules which forms a low costal areole, and in *Rock* 2636 these areoles are normally rather high and not essentially different from those of *C. angustipinnum.* From the arching veins one or, more often, two veins run to the sinus, often free but not infrequently anastomosing with the basal lateral veins from the costules, the other veins always free, simple or forked. In such cases the venation is not materially different from that of *C. angustipinnum*; it is more simple because the pinnae are deeply lobed. It is without question that the specimens mentioned belong to the same species, which thus shows partly the characters ascribed to *Egenolfia*; and as mentioned before, it is very probable that *Egenolfia* and *Campium* should be united.

The fertile piannae are entire or crenate, rather obtuse, 3 to 4 cm. long, 6 to 7 mm. wide.

Campium angustipinnum (Hayata) Copel. Philippine Journ. Sci. Bot. 37: 381. 1928.

YUNNAN: Between Keng Hung and Muang Hing, in dense forest, along brooks (2427).

This is the common Himalayan form called *Gymnopteris contaminans* by Beddome (Handb. Ferns Brit. Ind. 435) and in part *Leptochilus virens* of the Index Filicum. The nomenclature of this and related species is greatly confused. Although I am not quite sure that Copeland is right in his choice of names, I prefer here to use the name adopted by him for this most distinct species, excellently described by him.

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[25] Ferns Brit. Ind. *pl. 111* (left hand top figure). 1865.

[26] *Nephrodium cuspidatum* Presl, Rel. Haenk. 1: 31. 1825.

NEPHROLEPIS Schott

Nephrolepis cordifolia (L.) Presl.

YUNNAN: Between Kambaiti and Tengyueh (7702).

HUMATA Cav.

Humata repens (L. f.) Diels.

YUNNAN: Between Tengyueh and Lungling (7182).

Humata assamica (Bedd.) Diels.

YUNNAN: between Tengyueh and the Burmese border (7312). Between Kambaiti and Tengyueh (7580).

Beddome's illustration (Ferns Brit. Ind. *pl. 94*) agrees very well with the present specimens and I think my identification is right. In no description, however, is there mentioned the presence of 2 to 6 large ovate scales that occur on the lower part of the costae beneath.

This species, which is new to China, is very near *H. griffithiana*, mainly differing from that in the narrow, deltoid, short-stalked blades and in the scale character mentioned. The fronds are somewhat dimorphic in our specimens; the largest sterile blade is 21 cm. long, 7 cm. broad at base, and of rather thin texture; the largest fertile one is 15 cm. long by 4.5 cm. wide, short-stalked, and coriaceous. The rhizome and its scales and the shape of the ultimate segments and the indusia are very nearly the same as in *H. griffithiana*.

Humata griffithiana (Hook.) C. Chr.

Davallia griffithiana Hook. Sp. Fil. 1: 168. *pl. 49, B.* 1846; C. Chr. Ind. Fil. 210. 1905, with syn.

Davallia (Humata) *platylepis* Baker, Kew Bull. Misc. Inf. 1898: 229. 1898.

Davallia (Eudavallia) *henryana* Baker, Kew Bull. Misc. Inf. 1906: 8. 1906.

YUNNAN: Between Muang Hun and Muang Hai, epiphytic, in dry forest (2437).

I venture to transfer *Davallia griffithiana* Hook. to the genus *Humata*, with which it agrees much better in scales, texture, and indusia than with *Davallia*. The indusia of the typical form are shortly attached at the edges, though otherwise leucostegioid in shape; but if one prefers to hold *Humata* and *Leucostegia* as separate genera, the species must belong to the former.

Our specimen from Yunnan agrees exactly with the two species described by Baker on the same collection number (*Henry* 10082, Herb. Kew). I have seen both type specimens, and they belong undoubtedly to the same species, although Baker referred them to two different subgenera of *Davallia*. All these specimens from Yunnan differ a little from typical *D. griffithiana* in having the indusia wholly free at the sides. At first I had referred *Rock* 2437 to *Humata tyermanii* Moore and perhaps rightly so, though I am inclined to regard this also as a form of *H. griffithiana*.

LEUCOSTEGIA Presl

Leucostegia immersa (Wall.) Presl.

YUNNAN: Between Tengyueh and Lungling (7240). East of Tengyueh (7618).

Leucostegia pulchra (D. Don) Moore.

YUNNAN: Western slopes of the Likiang Snow Range, near Gan Hoi Tze, altitude about 3,000 meters; wet mossy bank of brook (4156).

A form approaching the next species.

Leucostegia pseudocystopteris (Kunze) Bedd. Ferns Brit. Ind. Suppl. 4. 1876.

Davallia pseudocystopteris Kunze, Bot. Zeit. 8: 68. 1850.

Davallia anthamantica Christ, Mém. Soc. Bot. France 1: 65. 1905.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,000 to 3,900 meters elevation (4460, 5985, 6054).

Leucostegia perdurans (Christ) Hieron. Hedwigia 62: 12. 1920.

Davallia perdurans Christ, Bull. Herb. Boiss. 6: 976. 1898.

YUNNAN: Salween Ridge, east of Tengyueh, altitude 2,400 meters (7732).

Leucostegia clarkei (Baker) C. Chr.

Davallia clarkei Baker in Hook. & Baker, Syn. Fil. ed. 2, 91. 1874; C. Chr. Ind. Fil. 208. 1905.

Davallia dareaeformis Levinge; Clarke, Trans. Linn. Soc. II. Bot. 1: 443. 1880, in part.

Leucostegia clarkei var. **faberiana** C. Chr.

Davallia clarkei var. *faberiana* C. Chr. Medd. Bot. Trädg. Göteborg 1: 73. 1924.

YUNNAN: West of the Mekong, from Pingpo to Tengyueh (7047). Salween Ridge, east of Tengyueh, altitude 2,400 meters (7720).

BURMA: Between Sadon and Yunnan border, epiphytic in dense forest, at 2,100 meters elevation (7418).

A most handsome fern, very finely cut, of a golden-brown color, and delicate in texture. It is perhaps specifically different from the genuine *L. clarkei*, being much larger, the pinnae sometimes 30 cm. long. The blade is broadly deltoid, the rachises with large scattered scales beneath as in *L. perdurans*.

Leucostegia dareaeformis (Hook.) Bedd.

Polypodium dareaeforme Hook. Second Cent. Ferns *pl. 24.* 1860; C. Chr. Ind. Fil. 521. 1906.

YUNNAN: Salween Ridge, west of the Mekong, en route from Pingpo to Tengyueh, at 2,400 meters elevation (7046).

I have little doubt that this sepcies is an exindusiate *Leucostegia*. Clarke was wrong in uniting it with *L. clarkei*, from which is differs in its much narrower rhizome scales and in having rachises castaneous below, yellowish green above.

New to China.

DAVALLIA J. E. Smith

Davallia bullata Wall.

YUNNAN: Between Tengyueh and Lungling (7154).

MICROLEPIA Presl

Microlepia marginata var. **calvescens** (Hook.) C. Chr.

Davallia calvescens Wall.; Hook. Sp. Fil. 1: 172. *pl. 48, B.* 1846.

BURMA: Keng Tung Territory, valley of the Meh Len (2180, 2190).

YUNNAN: Between Chieng Law and Muang Hun (2377).

Microlepia platyphylla (D. Don) J. Smith.

BURMA: Keng Tung Territory: Valley of the Meh Len (2129); between Pang Hoi Hpi and Peng Sai (2232).

Microlepia kurzii (Clarke) Bedd.

BURMA: Keng Tung Territory: Valley of the Meh Len (2083); Meh Lui watershed (2311).

Microlepia strigosa (Thunb.) Presl.

YUNNAN: Between Tengyueh and the Burmese border (7315, 7316). Shweli-Salween watershed, east of Tengyueh, altitude 2,100 to 2,400 meters (7857).

Microlepia pilosula (Wall.) Presl.

YUNNAN: Between Tengyueh and the Burmese border (7349). Salween Ridge, east of Tengyueh, altitude 2,400 meters (7734).

Not found in Matthew's list.

Microlepia trapeziformis (Roxb.) Kuhn.

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Peng Sai (2230).

YUNNAN: Between Tengyueh and Lungling (7142).

Microlepia trapeziformis var. **rhomboidea** (Wall.) C. Chr.

Davallia rhomboidea Wall.; Kunze, Bot. Zeit. 8: 158. 1850.

YUNNAN: Valley of the Meh Len (2086).

Microlepia hirta (Kaulf.) Presl.[27]

BURMA: Keng Tung Territory: Valley of the Meh Len (2088); Meh Lui watershed (2317).

DENNSTAEDTIA Bernh.

Dennstaedtia scabra (Wall.) Moore.

YUNNAN: Between Tengyueh and Lungling (7190).

ODONTOSORIA (Presl) Fée

Odontosoria chinensis (L.) J. Smith.

BURMA: Keng Tung Territory, valley of the Meh Len (2078, 2152).

YUNNAN: East of Tengyueh, along the Kuyung trail (7698).

MONACHOSORUM Kunze

Monachosorum subdigitatum (Blume) Kuhn.

BURMA: Between Sadon and the Yunnan border (7404, 7511a).

YUNNAN: Salween Ridge, east of Tengyueh, at 2,400 meters elevation, in dense forest; terrestrial (7635).

The plant described as *Monachosorum henryi* Christ is to me a form of this species.

LINDSAYA Dry.

Lindsaya cultrata (Willd.) Swartz.

YUNNAN: Between Tengyueh and Lungling (7189); between Kambaiti and Tengyueh, along banks of the Tako (7539).

Lindsaya malabarica (Bedd.) Baker.

Schizoloma malabaricum Bedd. Ferns Brit. Ind. *pl. 268.* 1868.

Schizoloma lobata var. *malabarica* Bedd. Handb. Ferns Brit. Ind. 79. 1883.

LOWER BURMA: Oktada, Martaban Hills, Kalama Range (750).

The specimen agrees closely with Beddome's description and plate, and I do not hesitate to consider it a distinct species, differing from *L. decomposita* Willd. (*Schizoloma lobata* Bedd.) by the long, slender, simply pinnate leaves, with the veins free, as a rule, but occasionally anastomosing.

This species has hitherto been known from southern India only.

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[27] I use for this species the common name *M. hirta*, although it is probable that the original *M. hirta* of Kaulfuss, from the Hawaiian Islands, is another species. The nomenclature of these large Microlepias is very confused and my material is too insufficient for positive delimitation of the species. The "*Microlepia hirta*" of southern China and India is perhaps not distinct from *M. speluncae*, as supposed by Beddome.

ATHYRIUM Roth

Athyrium dissitifolium (Baker) C. Chr. PLATE 18

Polypodium dissitifolium Baker, Kew Bull. Misc. Inf. **1895**: 54. 1895.

Polypodium apicidens Baker, Kew Bull. Misc. Inf. **1895**: 54. 1895.

Phegopteris incrassata Christ, Bull. Herb. Boiss. **6**: 963. 1898.

Dryopteris apicidens C. Chr. Ind. Fil. 252. 1905.

Dryopteris dissitifolia C. Chr. Ind. Fil. 262. 1905.

Dryopteris incrassata C. Chr. Ind. Fil. 272. 1905.

BURMA: Keng Tung Territory, between Pang Hoi Hpi and Peng Sai (2231).

YUNNAN: Between Keng Hung and Muang Hing, at 1,000 to 1,500 meters altitude; dry slopes (2666, 2691). Between Tengyueh and Lungling (7219).

This species has been known to me for many years as *Dryopteris incrassata* (*Henry* 11548!). I have now, on loan from Kew, for comparison, the type specimens (*Hancock* 45, 87) of the two species which were described, side by side and in nearly the same words, by Baker in 1895, and I find that there is hardly the slightest difference between them. Both are fully identical with *D. incrassata*, and I must therefore fall back upon Baker's first name, *dissitifolium*. Both Baker and Christ placed their new species in *Phegopteris*, but I have for a long time regarded the reference of this plant to the phegopteroid group in *Dryopteris* as highly problematical and now feel sure that it is really a species of *Athyrium*, although it is difficult to point out substantial reasons for this view. The absolutely exindusiate sori are, however, not always round, but are often elongate; the costae above are deeply channelled, the furrow quite glabrous, with sharp raised edges, as in most species of *Athyrium*, yet lacking the projecting spines found in several species of that genus; the linear-lanceolate scales of the stipe base and the venation agree much better with *Athyrium* than with any species of *Dryopteris*. Within the genus *Athyrium* the species is a most distinct one. The following notes, supplementary to the descriptions given by Baker and Christ, may be useful:

Rhizome erect, like the stipe bases clothed with linear-lanceolate, subulate, reddish-brown scales, the plant otherwise perfectly glabrous; stipe very slender, 15 to 25 cm. long, stramineous; blade lanceolate, not or slightly narrowed at base, coriaceous, gray-green, 30 to 40 cm. long, 15 cm. broad, but often much smaller; pinnae distant, often 3 cm. apart, short-stalked or nearly sessile, about 1 cm. broad, often falcate, deeply pinnatifid, terminating in a long serrate apex; segments oblong, sharply dentate outward with deltoid teeth, the thickened margins generally revolute; veins 4 to 6 jugate, simple, often thick, running into the teeth and reaching the thick margin; sori supramedial, often near the margin; spores with a low crest.

A bipinnate form of this species was found near Yunnan-fu by Cavalerie (Herb. C. Chr.).

Athyrium dissitifolium seems to be a common species in southern Yunnan and adjacent regions, being found also near Canton, and it is rather remarkable that it is not mentioned by the writers on Indian ferns. It is scarcely the same as Clarke's *A. drepanopterum* var. *kulhaitense* Atkins. (Review, p. 494), which is similarly exindusiate. Related to our species apparently is *A. rupicola* (Hope) C. Chr., but that is distinctly indusiate.

EXPLANATION OF PLATE 18.—*Athyrium dissitifolium*. The type specimen, *Hancock* 45, from Yunnan, in the Kew Herbarium. Two-fifths natural size.

Athyrium acrostichoides (Swartz) Diels, sens lat.

YUNNAN: Between Tengyueh and the Burmese border (7346). Kuyung, east of Tengyueh (7696).

The numerous Asiatic forms related to the North American *A. acrostichoides*, several of which Christ has dealt with as full species, are greatly in need of a critical revision.

Athyrium nephrodioides (Baker) Christ.

YUNNAN: Eastern slopes of the Likiang Snow Range, at about 3,150 meters elevation (5879, 5898).

The specimens agree closely with the type specimen from Ichang (*Henry* 1858; Kew!), but are less scaly; in the type the costae are furnished with rather numerous light brown, lanceolate scales beneath, whereas in our specimens they are almost scaleless.

The species is so near *A. fallaciosum* Milde that it may be doubted if it really is distinct. It differs chiefly in having the blade very long-attenuate below and in its longer sharply serrate segments.

Athyrium supraspinescens C. Chr., sp. nov. PLATE 19

Rhizome short, erect, clothed at apex with firm, lanceolate-acuminate, fuscous scales. Stipes few, slender, 10 to 20 cm. long, somewhat scaly at the blackish base, upward stramineous and glabrous, trisulcate above. Blade generally shorter than the stipe, narrowly ovate or subdeltoid-acuminate, 8 to 12 cm. long, 4 to 6 cm. broad, firmly herbaceous, pinnate-pinnatifid; pinnae close, 12 to 15 pairs, alternate, sessile (or the lowest short-petiolate), 2 to 3 cm. long, 6 to 10 mm. broad at base, thence tapering rather gradually to the short-acuminate but rather obtuse apex, unequal at base (cuneate at the lower side, truncate and subauriculate at the upper), incised about two-thirds the distance to the midrib, the basal ones not reduced; segments rectangular, rounded-truncate at apex, repand, crenate or obtusely toothed, the upper basal one generally somewhat elongate; veins about 4 on each side, simple, ascending, the lower ones reaching the margin above the sinus; sori large, oval or nearly round, situated on the lower part of the veins but at maturity nearly reaching from costule to margin, 1 to 3 to each segment, or in the smaller pinnae generally 1, then forming two confluent rows close to the midrib of the pinna; indusia small, evanescent, short, oblong, brown, convex (hippocrepiform shape not observed); spores bean-shaped, perfectly smooth. Upper part of rachis, costae, and costules above with long fleshy spines just below the base of the veins; entire blade without scales or hairs, but both surfaces (especially the upper) beset with glistening sessile glands.

YUNNAN: Top of Salween ridge, east of Tengyueh; altitude about 2,400 meters; November, 1922 (7721, type).

This small species can be compared only with *A. falcatum* Bedd., which it resembles in size and cutting; but the blade is not reduced below, and in the very prominent long spines on the costules above and in glandulosity it is very different from all other small species of *Athyrium* known to me.

EXPLANATION OF PLATE 19.—*Athyrium supraspinescens*. The type specimen, *Rock* 7721. About one-half natural size.

Athyrium macrocarpum (Blume) Bedd.

Athyrium anisopteron Christ, Bull. Herb. Boiss. 6: 962. 1898; Bull. Acad. Géogr. Bot. 17: 133. 1907.

BURMA: Near Kambaiti (7484).

YUNNAN: Salween Ridge, east of Tengyueh, altitude 2,400 meters; in forest (7007, 7723, 7725).

After long consideration I have arrived at the opinion that *A. anisopteron* Christ is a small, less cut form of *A. macrocarpum* and very likely the same

as var. *atkinsoni* Clarke[28] although its type looks rather different from the large forms of the species, owing to the obtuse and obtusely toothed or crenate segments. The four specimens of the Rock collection show, however, very instructive transitions between the two extremes. The largest frond of no. 7484 is, in size and division, typical *A. macrocarpum*, but in its obtuse segments it is quite like *A. anisopteron;* no. 7725 might be considered a large form of *A. anisopteron;* no. 7723, from the same locality and identical with 7007, is *A. anisopteron* as to size and division, but in the more sharply toothed segments it is like *A. macrocarpum*. The spores of all these forms with large sori are furnished with high reticulate crests and are very unlike those of *A. nigripes* and its allies.

Athyrium wardii (Hook.) Makino.

Asplenium sinense Baker, Kew Bull. Misc. Inf. 1906: 9. 1906.

Athyrium sinense C. Chr. Ind. Fil. Suppl. 15. 1913, not Rupr. 1845.

?*Athyrium mengtzeense* Hieron. Hedwigia 59: 319. 1917.

YUNNAN: Top of Salween Ridge, altitude 2,400 meters; in mossy forest (7005, 7006, 7034). East of Tengyueh (7731).

The proper identification of these specimens is difficult. No doubt they belong to *A. wardii* var. *elongatum* Christ,[29] which differs a little from genuine *A. wardii* in its ovate-lanceolate (not deltoid) blades. Here belongs also the type specimen of *A. sinense* Baker (*Henry* 10101; Kew!). The latter "species" was renamed *Athyrium mengtzeense* by Hieronymus, but the cotype (*Henry* 11101) at Berlin is rather different from the Kew specimen, being less incised, with oblong and obtusely toothed nonauriculate pinnules; it may, nevertheless, be a form of the same species.

I must confess, however, that I can not see clearly how this species as here interpreted may be separated with certainty from *A. nigripes* (Blume) Moore or, more correctly, from the north Indian Athyriums referred by all authors to that species. The best characters of *A. wardii* var. *elongatum* appear to be: Blade not deltoid but ovate in outline, the basal pair of pinnae shorter than the following; pinnules subentire, but commonly sharply dentate (almost spinulose) at the apex, auriculate or not at the anterior base, the anterior margin sometimes sublobate; basal pinnules of lowest pinnae generally much reduced; costae beneath shortly glandulose-pubescent. To *A. nigripes* I should refer specimens with a deltoid blade, with the segments about equally lobate on each side, with less sharp teeth, the costae glabrous beneath. I fear, however, that none of these characters hold good. English botanists have, no doubt, referred north Indian forms corresponding to *A. wardii* as here characterized to *A. nigripes*, and perhaps rightly so. In both species the short oblong or linear sori form two rows close to the midrib of the pinnules.

Very closely related to *A. wardii* and, I think, a variety of it may be mentioned *Athyrium roseum Christ* (*Henry* 9918!), with which *A. violascens* Diels (*Rosthorn* 1752!) is identical; it differs in its light green leaf tissue and its rose or violet colored, glabrous costae.

Another related form is **Athyrium otophorum** (Miquel) Rosenst.,[30] from Japan, from which I can not distinguish *Athyrium muticum* Christ[31] from Kweichou (*Cavalerie* 2741, 3722). It differs chiefly in its chartaceous texture, brown color, and less incised, closer, and decurrent pinnules.

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[28] Hook. & Baker, Syn. Fil. ed. 2, 489. 1874.

[29] Mém. Soc. Bot. France 1: 49. 1905.

[30] *Asplenium otophorum* Miquel, Ann. Mus. Bot. Lugd. Bat. 3: 175. 1867.

[31] Bull. Acad. Géogr. Bot. 17: 147. 1907.

Athyrium strigillosum Moore, in Lowe, Ferns Brit. Exot. 5: *pl. 36.* 1858.

Asplenium strigillosum Lowe, loc. cit.

Athyrium clarkei Bedd. Ferns Brit. Ind. Suppl. 11, *pl. 360.* 1876.

Asplenium clarkei Atkinson; Clarke, Trans. Linn. Soc. II. Bot. 1: 489. 1880.

Asplenium tenuifrons Wall. List, no. 206. 1828, in part (*nomen nudum*); Hope, Journ. Bombay Nat. Hist. Soc. 14: 120. *pl. 22.* 1902.

Athyrium petiolosum Christ, Bull. Acad. Géogr. Bot. 17: 134. 1907.

YUNNAN: Between Tengyueh and the Burmese border (7330). East of Tengyueh (7621, 7852).

BURMA: Between Sadon and the Yunnan border (7420); doubtful.

The oldest name of this species is perhaps *Asplenium gracile* Don; but the short description given by D. Don [32] is insufficient and fits equally several other species of *Athyrium* from the Himalaya. Hope followed Clarke (Review, p. 489) in uniting *A. tenuifrons* Wall. and *A. clarkei;* but he preferred to use the former name, which, however, had always been a *nomen nudum.* Thus, the name *Athyrium clarkei* should be taken up, unless, as I believe, Moore's *A. strigillosum* is just this species. The illustration and especially the figure of a pinna given by Lowe agree closely with *A. clarkei,* as does also the description, the gemmiferous rachis only not being mentioned; however, the larger form (*A. tenuifrons*) is often without buds.

I can not agree with Beddome in referring both *A. clarkei* and *A. tenuifrons* to *A. nigripes* as varieties. *Athyrium strigillosum* as here interpreted differs from that species in its smaller and narrower blades, which are of thin texture, often considerably narrowed below, and frequently viviparous by buds on the rachis, and in the presence of numerous callose spines not only on the costae but also on the costules above.

The two forms of *A. strigillosum* may be distinguished as follows: (1) *Athyrium clarkei.* Blade narrow, attenuate below, nearly always gemmiferous; pinnae sessile; (2) *Athyrium tenuifrons* Wall. Blade broader, slightly narrowed below, rarely gemmiferous; pinnae short-petiolate. *Athyrium petiolosum* Christ (*Ducloux* 50!) is about intermediate between these two forms; it is not gemmiferous, and the pinnae are somewhat longer-stipitate. Also, *A. viviparum* Christ,[33] from Kweichou, seems to be a form of this species and perhaps the same as *Athyrium clarkei* var. *membranacea* Rosenst.[34]

Athyrium setiferum C. Chr. Ind. Fil. 146. 1905 (?).

Asplenium tenellum Hope, Journ. Bombay Nat. Hist. Soc. 12: 529. *pl. 4.* 1899, not Roxb. 1816.

BURMA: Between Sadon and the Yunnan border, in forest near Kambaiti (7518, 7520).

As to essential characters the specimens agree rather well with Hope's description and illustration, but less so with specimens gathered by Hope himself. The dark green blade is not reduced below; it is larger (25 by 15 cm.), and the indusia are evanescent, the confluent rounded sori forming two compact rows close to the midrib. The costae and costules bear several weak reddish spines above.

In cutting the present species resembles *A. filix-femina,* but in its stalked pinnae and the presence of spines above it comes nearer to *A. nigripes.*

Athyrium nigripes (Blume) Moore.

BURMA: Between Sadon and the Yunnan border (7519).

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[32] Prodr. Fl. Nepal. 8. 1825.

[33] Bull. Acad. Géogr. Bot. 20[3]: 13. 1910.

[34] Repert. Sp. Nov. Fedde 13: 124. 1913.

Athyrium mackinnoni (Hope) C. Chr. Ind. Fil. 143. 1905.

Asplenium mackinnoni Hope, Journ. Bot. Brit. & For. 34: 124. 1896; Journ. Bombay Nat. Hist. Soc. 14: 122. *pl. 23.* 1902.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,000 meters elevation (4321).

The specimen is identical with another from Yunnan (*E. Maire*, Herb. C. Chr.) and agrees very well with Hope's description and figure quoted.

This species differs from *A. nigripes* in having most of the indusia hippocrepiform and in its light green lower surfaces.

Athyrium drepanopterum (Kunze) A. Br.

YUNNAN: Between Man Lo and Lungling (7183). Shweli Valley east of Tengyueh (7673). On lava flows near Tengyueh (7709). East of Tengyueh (7893, 7895). Near Tengyueh (7956).

BURMA: Between Sadon and the Yunnan border (7476).

Athyrium drepanopterum var. **funebre** Christ, Not. Syst. Lecomte 1: 46. 1909.

YUNNAN: Salween Ridge, west of the Mekong (7063). Shweli Valley, between Tengyueh and Lungling (7178).

BURMA: Between Sadon and the Yunnan border (7477).

Blades 10 to 15 cm. long, 3 to 5 cm. wide at base.

This is a much reduced but fully fertile form that resembles very closely *A. macrocarpum*, from which it may be distinguished by its coriaceous texture and smaller, deciduous, nonhippocrepiform indusia.

Athyrium filix-femina (L.) Roth, var.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 4,500 meters elevation (5931).

One of the many so-called varieties of this species from the Himalaya and southern China. It is about intermediate between Clarke's var. *retusa* and var. *flabellata*.

Athyrium foliolosum (Wall.) Moore.

YUNNAN: Salween Ridge, east of Tengyueh, altitude 2,400 meters; in forest (7598, 7613).

I identify these specimens according to Beddome's description (Handb. Suppl., p. 38). In no. 7613 the upper basal pinnules are very much enlarged, just as described by Beddome; less so in no. 7598, which on the whole is less divided.

Athyrium atkinsoni Bedd. Ferns Brit. Ind. Suppl. 11. *pl. 359.* 1876.

Asplenium atkinsoni Clarke, Trans. Linn. Soc. II. Bot. 1: 487. *pl. 57.* (var. *andersoni*). 1880.

Asplenium lastreoides Baker, Journ. Bot. Brit. & For. 26: 227. 1888.

Athyrium lastreoides Diels in Engl. & Prantl, Pflanzenfam. 1[4]: 224. 1899.

? *Davallia athyriifolia* Baker, Ann. Bot. 5: 200. 1891.

Athyrium monticola Rosenst. Repert. Sp. Nov. Fedde 13: 23. 1913.

Cystopteris grandis C. Chr. in Léveillé, Cat. Pl. Yun-Nan 100. 1916.

YUNNAN: Eastern slopes of the Likiang Snow Range, at about 3,150 meters elevation (5890, 5890a).

This widespread Chinese species is best known as *Athyrium lastreoides*, of which *Cystopteris grandis* C. Chr. is a direct synonym; but it agrees perfectly with Clarke's illustration of his *Asplenium atkinsoni* var. *andersoni* and is no doubt the same plant. Clarke remarks that Beddome's original illustration of *A. atkinsoni* probably represents a small, less cut leaf of the same species, and I think he is right; *Athyrium monticola* Rosenst. is a similar reduced form.

Beddome (Handb. Suppl., p. 37) has referred both Clarke's var. *andersoni* and *A. lastreoides* to *A. fimbriatum*. I do not understand this, since Beddome himself (Handbook, p. 172) described *A. fimbriatum* as having the ultimate pinnules auricled at the superior base, while in the present species they are equal sided at base. The indusia are very small and short, cystopteroid or leucostegioid; still it is not, on this account, excusable that I should have described the plant as a species of *Cystopteris* or that Baker should place it in *Davallia*, subgenus *Leucostegia*.

Athyrium sp.

YUNNAN: Eastern slopes of the Likiang Snow Range (5894).

A large, bipinnate-pinnatifid form, with basal pinnae 30 cm. long, which I must leave unnamed. We have in our bundle of *Athyrium umbrosum* a similar specimen collected in Nepal by Wallich, but it is certainly widely different from the genuine *A. umbrosum*. The very thick epigaeous caudex (10 cm. long) is evidently like that of *Asplenium bellum* Clarke, but the somewhat unequal-sided pinnules do not agree with Clarke's illustration (Review, *pl. 63, f. 2.*).

DIPLAZIUM Swartz

Diplazium lobbianum (Hook.) Moore.

Asplenium pinnatifido-pinnatum Hook. Sp. Fil. 3: 238. 1860.

Diplazium pinnatifido-pinnatum Moore, Ind. Fil. 331. 1861.

BURMA: Keng Tung Territory, between the Siamese border and Pang Mah Ki Hat (1937).

This is apparently a very rare species in these regions; Clarke and Beddome had only the material gathered by Griffith in Mishmee a century ago. The present specimens seem to prove that Clarke was right in referring Griffith's plants (*A. pinnatifido-pinnatum*) to the Malayan *D. lobbianum;* they agree very closely with the original illustration of the latter.[35] The blades have 11 pairs of free pinnae below the pinnatifid apex and are dark green above, pale green beneath; the stipes are tufted upon a short erect rhizome.

Diplazium japonicum (Thunb.) Bedd.?

YUNNAN: Between Tengyueh and the Burmese border (7339).

A critical plant, very much resembling some of the forms of *Athyrium acrostichoides*, but some of the sori are diplazioid.

GROUP OF DIPLAZIUM DILATATUM

The following species of *Diplazium* belong to a group of intimately related large forms, which are exceedingly difficult to deal with systematically. Although Baker, Beddome, and other conservative English writers recognize only four or five north Indian species of this alliance, Christ has described as new a score of species, several of which can not be regarded as valid. I have tried now to arrange in a key all the forms known to me from southern China and the Himalaya, but the result is not satisfactory and it is perhaps impossible to draw definite lines between really good species, if such exist; the same is true of the corresponding tropical American group centering in *D. expansum* and *D. ambiguum*. In minute characters most forms are nearly alike, and species distinctions must, therefore, be based upon the degree of division; but that character is not a good one, since these large plants vary greatly in cutting, as may be observed in cultivated plants, in which young fronds often are simply pinnate, older ones bipinnate or even tripinnate.

[35] Hook. Second Cent. Ferns *pl. 17.* 1860.

More stable characters are found, I think in the shape of the ultimate segments and the length of the sori, and in details of venation.

Veins partly united (2 or 3 lower pairs)----------D. esculentum (p. 305).
Veins all free.
Rachis asperous----------D. sikkimense (p. 304).
Rachis smooth.
Stipe and rachis with many blackish lanceolate scales.
D. squamigerum (Mett.) Christ.
Stipe and rachis naked or nearly so.
Blade pinnate-pinnatifid or bipinnate-subpinnatifid; ultimate segments broad, oblique or falcate, more or less acute; sori long, the basal anterior one often much curved or crescent-shaped.
Blade pinnate-pinnatifid----------D. veitchii (p. 302).
Blade bipinnate-subpinnatifid----------D. dilatatum (p. 302).
Blade bipinnate-pinnatifid or tripinnate-pinnatifid.
Blade tripinnate-pinnatifid----------D. orientale (p. 304).
Blade bipinnate-pinnatifid; sori mostly short.
Blades relatively small, subtripinnate; basal posterior tertiary segments or pinnules broad, deeply lobed.
D. leptophyllum (p. 303).
Blades larger, bipinnate-pinnatifid; basal posterior tertiary segments like the others.
Pinnules incised about halfway; segments broad, square (5 mm. long and broad), slightly toothed; sori short, often exindusiate.
D. flaccidum (p. 304).
Pinnules incised two-thirds down, or more; segments longer than broad.
Segments oblong, slightly oblique, truncate, toothed; sori short.
D. polypodioides (p. 304).
Segments longer, oblique or falcate, toothed at the tip only; sori longer----------D. viridissimum (p. 304).

Several other species of this group occur in eastern China and Japan, for example, *D. virescens* Kunze and *D. taquetii* C. Chr. Christ has referred specimens from southern China to the former, but I believe they belong to *D. viridissimum*.

Diplazium veitchii Christ, Bull. Acad. Géogr. Bot. 16: 125. 1906. PLATE 20

YUNNAN: Between Tengyueh and the Burmese border (7267, 7268).

These specimens differ from the type, *Wilson* 5357! (5375?), in the pinnae being incised halfway or more into broad, falcate, finely serrate lobes, with 6 or 7 simple or rarely forked veins, but otherwise they fully agree. It is highly probable that this species is a simply pinnate form of *D. dilatatum* and not essentially different from *Asplenium latifolium* var. *japonicum* Clarke (Review, p. 503.) A very similar form is *D. cavalerii* Christ (*Cavalerie* 49, 375, 7102), from Kweichou; and *D. veitchii* should perhaps be referred to it. It has narrower pinnae, with about 4 simple, distant, blackish green veins and a flexuose midrib.

EXPLANATION OF PLATE 20.—*Diplazium veitchii; Rock* 7267. Two-fifths natural size.

Diplazium dilatatum Blume.

Diplazium maximum C. Chr. Ind. Fil. 235. 1905, in part. Not *Asplenium maximum* D. Don, 1825.

Asplenium latifolium D. Don, Prodr. Fl. Nepal. 8. 1825.

The nomenclature of this species and *D. polypodioides* Blume is very confused. In 1825 David Don described briefly in his Prodromus the two species

Asplenium latifolium and *A. maximum*, both gathered in Nepal by Wallich; and in 1828 Blume also briefly described, from Java, *Diplazium dilatatum* and *D. polypodioides*, which are presumably the same as Don's two species. But I fear that my treatment of these species in the Index Filicum is wholly unsatisfactory. My error arose from Clarke's and Beddome's merging of Baker's *A. maximum* and *A. latifolium* (Syn. Fil. 239) into one species, *D. latifolium;* I chose, therefore, the name *maximum*, inasmuch as the name *latifolium* was preoccupied (Bory, 1803), overlooking the fact that Clarke (Review, p. 503) was of the opinion that *A. maximum* D. Don is the same as *D. polypodioides*. Having now carefully gone through Don's descriptions I feel sure that Clarke was right; *A. latifolium* ("foliolis incisi-crenatis") is *D. dilatatum* Blume, and the description of *A. maximum* ("foliolis alte pinnatifidis, soris nervo contiguis") fits very well *D. polypodioides* Blume, but also *D. sikkimense* (Clarke) and *Asplenium diversifolium* Wall., though certainly not the large fern called *D. latifolium* by most writers.

In the Botanical Museum at Copenhagen are found two forms from Nepal that were received from Wallich under the names *Asplenium polymorphum* Wall. and *A. diversifolium* Wall.; the former is *D. polypodioides*, the latter a variety of *D. dilatatum*. It is impossible to say which of these two forms corresponds to *A. maximum* D. Don; therefore I prefer to drop this name. To *D. dilatatum* I refer specimens with bipinnate blades and the secondary pinnules subentire to incised one-third to halfway down into broad, oblique, often falcate, acute segments; the sori are generally long, especially the basal anterior one, which often is much curved or even crescent-shaped. Delimited thus the species includes two forms or, perhaps, species:

(1) latifolium (D. Don). Dark green, firm, the pinnules incised one-third the distance to the midrib, or less; midribs of pinnae straight, not curved at base.

BURMA: Keng Tung Territory: Between Muang Len and Muang Hpyak (2036); Valley of the Meh Len (2184). Between Sadon and the Yunnan border (7443).

YUNNAN: East of Tengyueh (7858).

(2) diversifolium (Wall.). Light green, pinnules remote, incised halfway or two-thirds the distance to the midrib into very oblique segments with toothed tips; midribs strongly curved backward at base.

BURMA: Keng Tung Territory, Valley of the Meh Len (2134).

Asplenium torrentium Clarke is likely the same, Clarke's illustrations agreeing closely with our authentic specimen of *diversifolium*.

Here belongs also *Gymnogramme gigantea* Baker, from Hupeh (*Henry* 6517; Kew!). It is not exindusiate, as supposed by Baker, for traces of indusia are to be found. The pinnules are cut about two-thirds the distance to the midrib.

Closely related to *Gymnogramme gigantea* and considered by me a form of *D. dilatatum* is *Diplazium calogramma* Christ,[36] from Yunnan (*Henry* 11526!; not 1125, as quoted by Christ). Its pinnules are very deeply cut, the segments 1 to 1.5 cm. long and 5 mm. broad, the sori long and very regular.

Diplazium leptophyllum (Baker) Christ, Bull. Acad. Géogr. Bot. 11: 245. 1902.

Asplenium leptophyllum Baker, Kew Bull. Misc. Inf. 1906: 10. 1906.

YUNNAN: Between Keng Hung and Muang Hing (2577).

Very much like a small thin-leaved *D. polypodioides*, nearly tripinnate below, with the posterior basal tertiary segments in the larger pinnules broader than the others and deeply lobed, a character not seen in any form of *D. polypodi-*

[36] Not. Syst. Lecomte 1: 45. 1909; *Diplazium polypodioides* var. *henryi* Christ, Bull. Acad. Géogr. Bot. 16: 127. 1906.

oides; color dark green; sori short, with distinct indusia. The present specimen agrees very well with the type (*Henry* 13106; Kew!).

The name *leptophyllum* is actually not valid, but I have not assigned a new one, because it seems probable that this plant may prove to be a form of *D. squamigerum.*

Diplazium flaccidum Christ, Bull. Acad. Géogr. Bot. 16: 125. 1906.

Diplazium frondosum Christ, Not. Syst. Lecomte 1: 46. 1909.

SZECHWAN: Mount Omei (*Faber! Wilson* 5347!).

KWEICHOU: Pinfa (*Cavalerie* 2845, 7250!).

Christ identified this species with *Asplenium frondosum* Wall. (*Asplenium latifolium* var. *frondosa* Clarke (Review, p. 503), but no species has been described under this name.

Diplazium flaccidum is intermediate between *D. dilatatum* and *D. polypodioides.* The blades are dark green, with short, often exindusiate sori (like the latter), but are less incised, with close, square, truncate, scarcely oblique segments, these 5 mm. long and broad, slightly toothed, and often somewhat emarginate at the outer edge.

Diplazium polypodioides Blume.

Asplenium maximum D. Don. (See above under *D. dilatatum.*)

BURMA: Between Sadon and the Yunnan border, near Changtifang (7434).

YUNNAN: Between Tengyueh and Lungling near Man Lo (7140). East of Tengyueh, along Hsiao Ping Ho (7724).

The typical form of this species looks very distinct in its regularly and deeply pinnatifid, mostly sessile, dark green pinnules, with oblong, truncate-dentate, close, slightly oblique segments, and short sori; but some forms run into the next species. Mr. Rock's no. 7140 is such a large form, with the indusia almost perfectly obsolete.

Diplazium polypodioides var. **vestitum** Clarke.

YUNNAN: Dense forest, east of Tengyueh; altitude 2,400 meters (7611).

Rachises rather paleaceous but smooth; sori very short, about as in *D. sikkimense.*

Diplazium viridissimum Christ, Not. Syst. Lecomte 1: 45. 1909.

BURMA: Keng Tung Territory, Valley of the Meh Len (2131).

The specimen agrees perfectly with the type (*Ducloux* 106!). It is a very large plant, with pinnae up to 50 cm. long, dark green, and is very like a large form of *D. polypodioides.* In its longer sori, which are nearly exindusiate, its more distant and distinctly petiolate pinnules, and its oblique, often falcate segments, these toothed at the apex only, this species approaches the more divided forms of *D. dilatatum.*

Diplazium orientale Rosenst. Repert. Sp. Nov. Fedde 13: 128. 1913.

KWEICHOU: *Cavalerie* 2774! 3720!

Tertiary pinnules free or connected by a narrow wing, 2 to 2.5 cm. long, 5 mm. broad, deeply pinnatifid; sori filling the whole pinnule when mature.

Judging from the illustration, *Asplenium succulentum* Clarke[37] is very near this species and is perhaps the same.

Diplazium sikkimense (Clarke) C. Chr.

Asplenium sikkimense Clarke, Trans. Linn. Soc. II. Bot. 1: 500. *pl. 65, f. 1.* 1880.

BURMA: Keng Tung Territory, Valley of the Meh Len (2183).

This is a very characteristic fern, by its rough rachises closely related to the Malayan *D. asperum* Blume, and Beddome was possibly correct in refer-

[37] Trans. Linn. Soc. II. Bot. 1: 502. *pl. 64, f. 4.* 1880.

ring it to that species, from which it differs chiefly by its extremely short sori, placed close to the midrib; they are rarely more than 1 mm. long, the indusia persistent, red, vaulted, some of the lower ones diplazioid. In general aspect and cutting it resembles large forms of *D. polypodioides*. According to Mr. Rock the trunk is small and erect.

Diplazium esculentum (Retz.) Swartz.

BURMA: Keng Tung Territory, Valley of the Meh Len (2114, 2143, 2144).

ASPLENIUM L.

Asplenium nidus L.

BURMA: Beyond Sadon, near the Yunnan border (7467).

Asplenium nidus var. **phyllitidis** (D. Don) Bedd.

BURMA: Keng Tung Territory, Valley of the Meh Len (2181).

Asplenium ensiforme Wall.

BURMA: Changtifang, near the Yunnan border (7397).

YUNNAN: Between Tengyueh and the Burmese border (7311, 7355, 7380). Between Kambaiti and Tengyueh (7554). Mountains above Tseku and Tsehchung, Salween Valley, altitude 2,850 meters (11508).

SZECHWAN: Mili Kingdom, Waerh Dja Mountains (6472).

Asplenium trichomanes L.

SOUTHEASTERN TIBET: Near Champutong, Salween Valley; altitude 2,700 meters (11528).

Asplenium normale D. Don.

YUNNAN: West of the Mekong, Salween ridge (7028). East of Tengyueh, forest of Kao Tien (7874).

A small epiphytic form from Kambaiti, Burma (7508), with pinnae 7 to 8 mm. long and only 3 mm. broad, is referred to var. *minus*. It possibly represents *A. monanthemoides* Roxb.

Asplenium unilaterale Lam.

BURMA: Between the Siamese border and Pang Mah Ki Hat (1947a).

Asplenium unilaterale var. **rahaoense** (Yabe) Hayata, Journ. Coll. Sci. Univ. Tokyo 30: 438. 1911.

BURMA: Between the Siamese border and Pang Mah Ki Hat (1947).

YUNNAN: Between Tengyueh and Lungling (7089).

A very large form of *A. unilaterale*, with pinnae 6 cm. long and 1 to 1.5 cm. broad. It is very similar to *A. obscurum* Blume, but the stipe and rachis are castaneous as in the type.

Asplenium cheilosorum Kunze.

YUNNAN: Between Tengyueh and Lungling, on rocks (7218).

BURMA: Between Sadon and the Yunnan border; terrestrial, in dense forest (7425).

Asplenium planicaule Wall.

YUNNAN: West of the Mekong, from Pingpo to Tengyueh (7010). Between Tengyueh and Lungling (7121). Between Tengyueh and the Burmese border (7348, 7360). Between Kambaiti and Tengyueh (7559). East of Tengyueh (7855).

BURMA: Between Sadon and the Yunnan border (7417).

Very variable in size and in depth of incisures, but I find no real intermediates between this species and *A. laciniatum* Don, with which Clarke and Beddome united it. In this the stipe and lower half of the rachis are castaneous beneath, green above; in *A. laciniatum*, green throughout. Also, the stipe of the latter

is much more scaly and the blade different in cutting, as well shown by Hooker's illustrations of the two species. Recently Hieronymus [38] has pointed out differences in the structure of the scales. On the other hand, *A. planicaule* seems to run gradually into the following species.

Asplenium crinicaule Hance.

Asplenium polytrichum Christ, Bull. Acad. Géogr. Bot. 20[1]: 172. 1909.

YUNNAN: Between Keng Hung and Muang Hing (2712).

This differs from *A. planicaule* mainly in its larger size, less incised pinnules, and rather densely crinite rachis.

Asplenium laciniatum D. Don.

BURMA: Between Sadon and the Yunnan border (7422, 7517).

Asplenium yunnanense Franch.

YUNNAN: Eastern slopes of the L'kiang Snow Range, in limestone crevices; altitude 2,700 meters (4878, 6001).

Asplenium bullatum Wall.; Mett. Abh. Senckenb. Ges. Frankfurt 3: 150. 1859.

Asplenium grandifrons Christ, Bull. Herb. Boiss. 7: 9. 1899.

Asplenium latecuneatum Christ, Bull. Acad. Géogr. Bot. 20[1]: 171. 1909.

Asplenium cavalerianum Christ, Bull. Acad. Géogr. Bot. 20[1]: 173. 1909.

YUNNAN: Between Tengyueh and the Burmese border (7370). Environs of Tengyueh (7955).

Hieronymus [39] has shown that the Himalayan fern referred by Hooker, Clarke, Beddome, and others to *Asplenium bulbiferum* is well distinguished from the type of that species from New Zealand, and further that *A. cavalerianum* Christ, from Kweichou (*Cavalerie* 2846!), belongs to the same form, first described by Mettenius as *A. bullatum* Wall. *Asplenium cavalerianum* is, however, also identical with *A. grandifrons* Christ (*Henry* 11521! in Herb. Christ) and with several sheets of Wallich's original collection in Copenhagen. *Asplenium latecuneatum* Christ was also based on *Cavalerie* 2846; it differs from the type by being less divided (bipinnatifid only), but otherwise is identical. The degree of division is a poor specific character in *Asplenium*, especially in the *bulbiferum* group; one of Wallich's specimens from Nepal belongs to the same form.

Asplenium bullatum seems to be widely distributed through southern China; it was recently (1926) found in the province of Fukien, near Foochow (*Herb. Fukien Christian University* 5790).

CETERACH Lam. & DC.

Ceterach dalhousiae (Hook.) C. Chr.

YUNNAN: East of Tengyueh, between Hsiao Chai and summit of Shweli-Salween ridge; altitude 2,700 meters (7595).

New to China.

BLECHNUM L.

Blechnum orientale L.

BURMA: Keng Tung Territory, Valley of the Meh Len (2076).

YUNNAN: Between Tengyueh and Lungling (7234).

PRAINEA J. Smith

Brainea insignis Hook.

BURMA: Keng Teng Territory, ridge between Muang Len and Meh Kong river-basin; common (2028).

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[38] Hedwigia 61: 33. 1919.

[39] Hedwigia 61: 4. 1919.

WOODWARDIA J. E. Smith

Woodwardia japonica (L.) J. E. Smith.

BURMA: Keng Tung Territory, ridge between Muang Len and the Meh Kong (2006).

New to Burma.

Woodwardia radicans var. **unigemmata** Makino, Jap. Journ. Bot. 2: 7. 1918.

Woodwardia unigemmata Nakai, Bot. Mag. Tokyo 39: 103. 1925.

YUNNAN: Between Hsiao Chai and summit of Shweli-Salween ridge (7627). East of Tengyueh (7879).

In his recent key to the species of this genus, Nakai considers this common fern of southern China specifically different from *W. radicans*. My material does not justify this segregation.

CONIOGRAMME Fée

Coniogramme fraxinea (D. Don) Diels.

YUNNAN: Between Muang Hun and Muang Hai (2401).

Coniogramme intermedia Hieron. Hedwigia 57: 301. 1916.

YUNNAN: Between Tengyueh and the Burmese border (7340). Eastern slopes of the Likiang Snow Range, at 3,450 meters elevation (7757).

Coniogramme spinulosa (Christ) Hieron. Hedwigia 57: 311. 1916.

SOUTHEASTERN TIBET: Forests of Doyan Longba, altitude 3,000 meters (11627).

Coniogramme procera (Wall.) Fée.

YUNNAN: Between Tengyueh and the Burmese border (7328).

The four species of *Coniogramme* here listed would all fall under *C. fraxinea*, regarding that species in the usual broad sense. The several new species proposed by Hieronymus in 1916 are chiefly characterized by the hydathodes and their distance from the teeth. Several of these will appear, I think, to be founded upon too weak characters, but others of them are certainly valid, for example, *C. spinulosa*.

GYMNOPTERIS Bernh.

Gymnopteris vestita (Wall.) Underw.

YUNNAN: Eastern slopes of the Likiang Snow Range (6495).

NOTHOLAENA R. Br.

Notholaena delavayi (Baker) C. Chr.

Gymnogramme delavayi Baker, Ann. Bot. 5: 484. 1891.

Gymnopteris delavayi Underw. Bull. Torrey Club 29: 627. 1902.

Notholaena bureaui Christ, Mém. Soc. Bot. France 1: 59. 1905.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,150 meters elevation (4099, 5896).

As to all characters except simple pinnae this is so much like *N. marantae* that I am almost convinced it should be regarded as a simply pinnate form of that species. In no. 4099 some of the pinnae have a distinct auricle at the upper base, quite like a pinnule of *N. marantae*. Owing to the slight width of the pinnae (3 to 4 mm.), the broad sorus lines reach almost from the edge to the midrib.

Notholaena marantae (L.) R. Br.

YUNNAN: Western slopes of the Likiang Snow Range, near Ganhaitze, at about 3,000 meters altitude (4155).

Mettenius demonstrated[40] that the sporangia in this species are not confined to the thickened tips of the veins, but are borne also on their outer part, the sori thus becoming subgymnogrammoid. He therefore transferred the species to *Gymnogramme*. The two Chinese species, *N. delavayi* and *N. marantae*, show clearly this gymnogrammoid extension of the sori. The question then arises as to whether both these species should be placed under *Gymnopteris* or under *Notholaena*. *Gymnopteris* is, however, a composite genus, and it is not certain that the hairy species such as *G. rufa* (the type of the genus) and *G. vestita* are really congeneric with the scaly species, e. g. *G. delavayi* and *G. muelleri*. If two genera are here represented, the scaly species, among them *N. marantae*, should be referred to *Notholaena* as above, assuming *N. marantae* to be the generic type. In this case the species with true marginal sori hitherto referred to *Notholaena* could naturally be placed under *Cheilanthes*, following Mettenius. It is not certain, however, that *Acrostichum marantae* L. should be adopted as the type of *Notholaena*.

CHEILANTHES Swartz

Cheilanthes albofusca Baker.

Cheilanthes mairei Brause, Hedwigia 54: 202. *pl. 4, D.* 1914.

YUNNAN: Likiang Snow Range, at 2,700 meters elevation (4879, 5998).

Cheilanthes taliensis Christ.

Cheilanthes henryi Christ, Bull. Acad. Géogr. Bot. 16: 133. 1906.

Cheilanthes bonatiana Brause, Hedwigia 54: 203. *pl. 4, E.* 1914.

YUNNAN: Likiang Snow Range, at 2,700 to 3,450 meters elevation (6000, 6047).

Cheilanthes farinosa (Kaulf.) Forsk.

YUNNAN: Eastern slopes of the Likiang Snow Range (3561, 6012). Between Tengyueh and Bhamo (7830).

BURMA: Between Sadon and the Yunnan border, forest of Kambaiti (7492).

Cheilanthes farinosa var. dalhousiae (Hook.) Clarke, Trans. Linn, Soc. II, Bot. 1: 457. *pl. 51.* 1880.

YUNNAN: Eastern slopes of the Likiang Snow Range (6496).

I agree with Clarke in considering this a nonfarinose form of *C. farinosa*.

Cheilanthes subrufa Baker, Kew Bull. Misc. Inf. 1906: 8. 1906.

Cheilanthes leveillei Christ, Bull. Acad. Géogr. Bot. 17: 149. 1907.

YUNNAN: Likiang Snow Range, at 2,700 meters altitude (5999).

A problematical species, very likely a variety of *C. rufa* Don. The type specimen (*Henry* 11831; Kew!) looks rather different from that species in its broadly deltoid blade, but other specimens from Yunnan (*Henry* 9080) and Kweichou (*Cavalerie* 1803), with which *Rock* 5999 fully agrees, have less deltoid and narrow blades, and *Cheilanthes leveillei* Christ is a form with lanceolate blade narrowed below, just as in *C. rufa*. Otherwise, all the specimens quite agree as to vestiture and in the greenish white or pale yellowish farina of the under side. However, the indusia are closer, larger, and more definitely lacerate-fimbriate than in *C. rufa*, and the large lanceolate scales of the rhizome and lower part of the stipe are castaneous, with broad hyaline margins.

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[40] Fil. Hort. Lips. 43. 1856.

Cheilanthes albomarginata Clarke is evidently very closely related to *C. subrufa*, and is perhaps the same. It was found in Yunnan by Hancock (no. 15). Very likely *C. dubia* Hope is this species, also.

Cheilanthes subvillosa Hook. Sp. Fil. **2**: 87. *pl. 98, B.* 1852.

Cheilanthes yunnanensis Brause, Hedwigia **54**: 204. *pl. 4.* 1914.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,150 meters altitude (5891).

This species, rare in the Himalaya, seems to be common in Yunnan. I have specimens from Yunnan, collected by Maire, Ducloux, and Siméon Ten, and others from southern Szechwan (*H. Smith* 2010) which agree perfectly with Hooker's illustration and with the more accurate description of Clarke (Review, p. 456). Brause was of the opinion that his new species differs from *C. subvillosa* in scale characters, but in my rather numerous specimens the scales vary considerably in color, from castaneous to pale. Mr. Rock's no. 5891 would fall within Brause's var. *dilatata* of *C. yunnanensis*; it is a very large form, the blades 25 cm. long by 15 cm. wide.

Christ confounded this species with *C. patula* Baker, a widely different plant. All the specimens in his herbarium under that name belong to *C. subvillosa.*

HYPOLEPIS Bernh.

Hypolepis punctata (Thunb.) Mett.

BURMA: Keng Tung Territory, Meh Lui watershed, between Muang Mah and the Yunnan border (2337).

ONYCHIUM Kaulf.

Onychium japonicum var. lucidum (D. Don) Christ.

YUNNAN: Between Keng Hung and Muang Hing (2699). Between Tengyueh and Bhamo (7835).

Onychium siliculosum (Desv.) C. Chr.

BURMA: Keng Tung Territory, Valley of the Meh Len (2073, 2150).

YUNNAN: Between Tengyueh and Bhamo (7827, 7827a).

CRYPTOGRAMMA R. Br.

Cryptogramma brunoniana R. Br.

YUNNAN: Mountains above Tseku and Tsehchung, altitude 3,300 meters (11606).

PLAGIOGYRIA (Kunze) Mett.

Plagiogyria henryi Christ. PLATE 21

Lomaria decurrens Baker, Kew Bull. Misc. Inf. 1906: 9. 1906.

YUNNAN: Between Kambaiti and Tengyueh (7571). East of Tengyueh, near Kuyung (7699).

A very distinct plant, of thin texture, with the lower 5 or 6 pinnae reduced to roundish toothed auricles. It is closely related to *P. stenoptera* (Hance) Diels,[41] with one pair of auriculiform pinnae only, to which I refer *P. tenuifolia* Copel.[42] and *Lomaria matthewii* Christ as a variety having the basal pinnae less reduced. Further material will perhaps show that *P. tenuifolia* Copel. and *P. henryi* Christ are the extreme forms of a single species that varies as to degree of reduction of the lower pinnae.

EXPLANATION OF PLATE 21.—*Plagiogyria henryi; Rock* 7699. Two-fifths natural size.

[41] See Hook. Icon. Pl. *pl. 1644.*

[42] Philippine Journ. Sci. Bot. **3**: 281. 1908.

Plagiogyria glauca (Blume) Mett.

YUNNAN: Tsangshan Range near summit; altitude 3,000 meters (3151). Between Tengyueh and the Burmese border (7389). East of Tengyueh (7659). Salween Valley, border of Tsarong, Tibet (11496).

Plagiogyria glauca var. **virescens** C. Chr., var. nov.

YUNNAN: West of the Mekong, from Pingpo to Tengyueh (7068). Summit of Hsueh Shan Ting, east of Tengyueh (7644, type).

Differs from the typical form in the direction of *P. pycnophylla* by the pale green or even brownish green, not whitish glaucous leaves.

Plagiogyria euphlebia (Kunze) Mett.

YUNNAN: Between Kambaiti and Tengyueh (7572).

ADIANTUM L.

Adiantum philippense L.

Adiantum lunulatum Burm. Fl. Ind. 235. 1768.

YUNNAN: West of Talifu, en route to Tengyueh (6628).

Adiantum caudatum L.

BURMA: Keng Tung Territory, Meh Lui watershed (2329).

Adiantum edgeworthii Hook.

YUNNAN: Environs of Tengyueh (7970).

Adiantum edentulum Christ, Mém. Soc. Bot. France 1: 63. 1905.

YUNNAN: Eastern slopes of the Likiang Snow Range, at about 3,300 meters altitude (5677, 6010).

This species is intermediate between *A. capillus veneris* and *A. venustum*, and is very probably the same as *A. wattii* Baker. *Adiantum delavayi* Christ (loc. cit.) is scarcely different. The character, "sori orbicular-reniform or long and straight" is not a constant one. The present specimens show both kinds on fronds from the same rhizome.

Adiantum davidi Franch.

YUNNAN: Between Likiang and Youngpei (5154). Between Likiang and Tsilikiang (8513).

Adiantum davidi var. **prattii** (Baker) C. Chr. Medd. Bot. Trädg. Göteborg 1: 94. 1924.

Adiantum prattii Baker, Journ. Linn. Soc. 29: 321. 1892.

SOUTHEASTERN TIBET: Champutong; altitude 2,700 meters (11527).

Adiantum pedatum var. **glaucinum** Christ, Bull. Herb. Boiss. 6: 957. 1898.

Adiantum myriosorum Baker, Kew Bull. Misc. Inf. 1898: 230. 1898.

SOUTHEASTERN TIBET: Forests of Doyan Longba (11629).

PTERIS L.

Pteris vittata L.

YUNNAN: Slopes of Moting Shan, northeast of Yangtze-Mekong watershed (10343).

Pteris pellucida Presl.

BURMA: Keng Tung Territory: Between Pang Hoi Hpi and Peng Sai (2246); Meh Lui watershed (2282).

Pteris esquirolii Christ, Not. Syst. Lecomte 1: 50. 1909.

BURMA: Keng Tung Territory, Valley of the Meh Len (2188).

YUNNAN: Between Mohei and Maokai, watershed of the Black River (Papienho) (2912).

Identified from the original description. Near *P. pellucida*, but extremely dimorphic; pinnae of the sterile frond 3.5 cm. broad with sharply serrated tips, and of the fertile one 1 cm. broad or less.

Pteris heteromorpha Fée.

YUNNAN: Between Chieng Law and Muang Hun (2364).

New to China. Apparently a rare and little known species, allied to *P. cretica*, with most of the distant, long, linear pinnae entire or auriculate at the upper base, the lower ones often pinnatifid at base. The specimens at hand correspond closely to Beddome's illustration (Ferns Brit. Ind. *pl. 89.*).

Pteris cretica L.

YUNNAN: Between Mohei and Maokai, watershed of the Black River (2996). Top of Salween ridge (7037). Between Tengyueh and Man Lo (7147). Forest beyond Shweli, east of Tengyueh (7589).

Pteris dactylina Hook.

Pteris henryi Christ, Bull. Herb. Boiss. 6: 957. 1898.

YUNNAN: Eastern slopes of the Likiang Snow Range (3659, 4854, 4880).

No. 4854 is typical *P. dactylina;* the other specimens would be referred to *P. henryi* Christ (*Henry* 9911!), a larger form with the rachis prolonged and a pair of lateral pinnae above the basal furcate ones. I can not, however, consider this form even a variety.

Pteris ensiformis Burm.

BURMA: Keng Tung Territory, between Muang Len and Muang Hpyak (2031).

Pteris semipinnata L.

YUNNAN: Between Tengyueh and the Burmese border (7343).

Pteris dissitifolia Baker.

YUNNAN: Between Chieng Law and Muang Hun (2369).

The specimen is identical with the type at Kew (*Balansa* 1790!). This species is very like a large form of *P. semipinnata* L., with the lower two pairs of pinnae equally pinnate on each side; stipe and rachises purplish. New to China.

Pteris decrescens Christ, Bull. Acad. Géogr. Bot. 16: 244. 1906.

YUNNAN: Salween Ridge, east of Tengyueh, altitude 2,400 meters (7716).

The specimen agrees with authentic material from Kweichou (*Cavalerie* 2038, 3761!) and Kwantung (*Matthew!*) in the unforked basal pinnae, but differs in its obtuse segments and in not having the pinnae long-caudate. The determination is, therefore, uncertain.

Pteris quadriaurita Retz.

YUNNAN: Between Tengyueh and Lungling (7087).

Pteris sp.

YUNNAN: Puerhfu to Mohei (2867).

The material, which is scanty, belongs to the group of *P. quadriaurita*, but I have not succeeded in identifying it with any of the species described by Hieronymus.

Pteris aspericaulis Wall.; Hieron. Hedwigia 55: 348. 1914.

YUNNAN: East of Tengyueh (7880).

Pteris aspericaulis var. **roseo-lilacina** (Hieron.). C. Chr.

Pteris roseo-lilacina Hieron. Hedwigia 55: 350. 1914.

YUNNAN: West of Talifu, en route to Tengyueh, near Tu Kwe San Temple (6652). Between Tengyueh and the Burmese border (7269).

Although *Pteris roseo-lilacina* was described from an incomplete sterile frond (*Henry* 13222), I have no doubt that Mr. Rock's specimens belong to this form, which is well marked by the beautifully wine-colored rachises. I can not, however, regard this character as of specific importance, especially inasmuch as genuine *P. aspericaulis* to some extent shows the same coloration.

Pteris excelsa Gaud.

YUNNAN: Between Tengyueh and the Burmese border (7345).

I can not find any difference between the Asiatic form and the Hawaiian type.

Pteris longipinnula var. hirtula C. Chr., var. nov.

BURMA: Keng Tung Territory, valley of the Meh Len (2133, type; U. S. Nat. Herb. 1,211,373). Also no. 2091 from the same locality.

Differs from the typical form of the species in having the costae and midribs of the segments short-pubescent beneath, and in the rounded-obtuse sterile tips of the segments, these not mucronate.

Pteris biaurita L.

YUNNAN: Between Kao Tien and Tengyueh, on lava flows (7710).

Pteris biaurita var. intermittens C. Chr., var. nov.

YUNNAN: Between Keng Hung and Muang Hing (2578).

Pinnae 15 cm. long, 2 cm. wide, incised about two-thirds, with obtuse falcate segments. Basal veins both furcate, the branches of the anterior one bending toward each other near the sinus, the posterior one springing from the costa of the pinnae far from the base of the midrib of the segment, forked from the base; in upper pinnae the basal veins free, in lower ones the opposed branches frequently united by a cross-vein, a short veinlet sometimes running thence toward the sinus.

A critical form with the venation partly that of *P. quadriaurita*, partly of *P. biaurita*.

Pteris longipes D. Don.

BURMA: Keng Tung Territory, Valley of the Meh Len (2179).

Pteris wallichiana Agardh.

YUNNAN: Between Tengyueh and Lungling (7237). Between Tengyueh and the Burmese border (7368). Between Kambaiti and Tengyueh (7565).

HISTIOPTERIS (Agardh) J. Smith

Histiopteris incisa (Thunb.) J. Smith.

YUNNAN: Between Tengyueh and the Burmese border (7321).

PTERIDIUM Gleditsch

Pteridium aquilinum (L.) Kuhn.

YUNNAN: Between Mohei and Maokai, watershed of the Black River (2906).

VITTARIA J. E. Smith

Vittaria sikkimensis Kuhn.

BURMA: Between Sadon and the Chinese border (7419).

Vittaria caricina Christ.

BURMA: Between Sadon and the Yunnan border (7395).

YUNNAN: Ridge forest east of Tengyueh; altitude 2,400 meters (7636).

This is the *Vittaria lineata* of most writers on Indian and Chinese ferns, and it is difficult to see how it may be distinguished from the true *V. lineata* of tropical America. The present specimens (35 cm. long, 2 mm. broad), are larger than the type of *V. caricina* Christ (*Cavalerie* 679!), but otherwise not different. In appearance it resembles *Drymotaenium*, but may be at once distinguished from this by the pyriform paraphyses, less rigid texture, and fresh green color.

Vittaria flexuosa Fée, Mém. Foug. 3: 16. 1851–52.

Vittaria japonica Miquel, Ann. Mus. Bot. Lugd. Bat. 3: 169. 1867.

Vittaria filipes Christ, Bull. Acad. Géogr. Bot. 17: 150. 1907.

YUNNAN: Between Tengyueh and Lungling (7224).

Vittaria doniana Mett.; Hieron. Hedwigia 57: 204. 1915.

BURMA: Between Sadon and the Yunnan border (7423, 7496).

Vittaria doniana var. angusta Hieron. Hedwigia 57: 205. 1915.

BURMA: Between Sadon and the Yunnan border (7398).

Vittaria doniana is very closely allied to *V. scolopendrina* (Bory) Thwaites; but it may be distinct from the true form of this species, which is from the Mascarene Islands. Evidently it is a very rare fern, apparently found only twice before in the eastern Himalaya by Griffith and Hooker & Thompson. Rather remarkably Clarke did not mention these finds in his Review, where *V. scolopendrina* is altogether omitted. Beddome (Handbook, p. 408) cites *V. scolopendrina* from the Himalaya, Sikkim, Assam, and Bhotan, presumably meaning the present species.

ANTROPHYUM Kaulf.

Antrophyum henryi Hieron. Hedwigia 57: 208. 1915.

YUNNAN: Between Lungling and Hsiangta (7235).

I have little doubt that this is a small form of *A. coriaceum*, with the narrowly oblanceolate fronds 1 cm. broad or less. In all essential characters (scales, plicate frond, taeniform paraphyses, reticulate sori, etc.) it fully agrees with that species, and as to the size also with some specimens of Wallich's original collection of *A. coriaceum* in the Copenhagen Herbarium. Provisionally, I prefer to maintain this small form as a species, because the boundaries between some of the Asiatic species are as yet not clear.

Antrophyum henryi is based upon *Henry* 11517A, in the Berlin Herbarium. I have not seen the actual type, but specimens of the same number in Christ's herbarium, which are identical with *Rock* 7235, were referred by Christ to *A. stenophyllum* Baker (*Henry* 9607; Kew!), which is figured by Benedict.[43] After a comparison between *Henry* 11517A and 9607 I am inclined to consider them two different species. *Antrophyum stenophyllum* differs from *A. henryi* in its linear-lanceolate (not oblanceolate) blades, with the sori generally forming two long vittarioid lines; but sometimes the sori show a tendency to become reticulate, as seen in Benedict's figure; further, the upper side is not plicate, and there is a rather distinct midrib in the lower third of the frond. In *A. henryi*, on the other hand, there is no midrib at all, and the sori form 4 or 5 anastomosing rows. The rhizome scales and paraphyses are very similar in both species.

Antrophyum stenophyllum is evidently the same as *A. reticulatum* var. *parvula* Clarke (Review, p. 573), but scarcely *A. parvulum* Blume, and most probably it is not specifically different from *A. vittarioides* Baker, from Tonkin (*Balansa* 1921; Kew!). This, as to scales, size, midrib, and two long sorus lines, is very nearly the same as *A. stenophyllum*, but the paraphyses are narrower and the sori show no tendency to become reticulate, though portions of a second parallel line occasionally occur.

Antrophyum vittarioides is said by Van Alderwerelt van Rosenburgh[44] to occur in Borneo, but the plant illustrated by him is at least not typical, having

[43] Bull. Torrey Club 39: *pl.* 7, *f.* 1–2. 1911.

[44] Bull. Jard. Bot. Buitenzorg II. 11: 2. *pl.* 2. 1913.

the sorus lines much closer to the edge than in the type. The same writer has described[45] a var. *major* of *A. vittarioides*, collected in Sumatra by Dr. C. G. Matthew, who kindly has presented me with a cotype specimen. This form is specifically different from *A. vittarioides* in its hair-pointed rhizome scales, in having the midrib evanescent a little above the base, and the sorus lines very near to the edge; the frond is entirely vittarioid in general aspect, but the hairlike paraphyses and tetrahedral spores are those of *Antrophyum*.

Summarizing the above remarks, I believe (1) *A. henryi* to be a small form of *A. coriaceum*, (2) *A. stenophyllum* to be a form of *A. vittarioides*, and (3) the Malayan plants to represent a third, undescribed species.

Antrophyum coriaceum (D. Don) Wall.

YUNNAN: Between Muang Hun and Muang Hai (2403). Banks of the Meh Kong, near Keng Hung (2522).

A large form of this species, the blades 20 cm. long by 3 cm. broad, very much resembling *A. reticulatum*, but distinctly plicate above.

Antrophyum reticulatum is recorded from Yunnan by Christ,[46] but the specimens probably belong to *A. coriaceum*.

Antrophyum obovatum Baker, Kew Bull. Misc. Inf. 1898: 233. 1898.

Antrophyum petiolatum Baker, Kew Bull. Misc. Inf. 1906: 14. 1906.

BURMA: Between Sadon and the Yunnan border (7501).

The present specimens are small, exactly like one plant of *Henry* 9153B, the type of *A. petiolatum* Baker (Kew!). *Antrophyum obovatum* Baker (*Henry* 9153A; Kew!) is somewhat larger, the blade up to 10 cm. broad, but is otherwise identical with the former. In Christ's herbarium *Henry* 9153A is exactly the same as 9153B at Kew, and there remains no doubt that here again Baker described the same plant twice.

Antrophyum obovatum comes near to *A. latifolium* Blume, but seems to be a distinct species. It differs in having the blade, especially of smaller leaves, rather long-cuneate at base and attenuate into the thick fleshy stipe, not abruptly rounded as in *A. latifolium;* the sori are very slightly immersed and the paraphyses capitate with a large subglobose end-cell, while the paraphyses of *A. latifolium* are clavate with a lengthened end-cell. *Antrophyum latifolium* is said by Clarke (Review, p. 573) to be frequent in the eastern Himalaya, but it is very probable that this north Indian "*A latifolium*" is *A. obovatum*.

DRYMOTAENIUM Makino

Drymotaenium miyoshianum Makino.

YUNNAN: Mountain forest above Tseku, at 3,000 meters elevation (10057).

LEMMAPHYLLUM Presl.

Lemmaphyllum carnosum (Wall.) Presl, Epim. Bot. 158. 1849.

Drymoglossum carnosum J. Smith in Hook. Gen. Fil. *pl. 78, A.* 1841.

YUNNAN: Between Tengyueh and the Burmese border (7367). East of Tengyueh (7622, 7957a).

I have recently discussed elsewhere this and related species, as indicated under *Polypodium neurodioides* (p. 318).

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[45] Op. cit. 16: 56. 1914.

[46] Bull. Herb. Boiss. 1: 3. 1899.

POLYPODIUM L.

Subgenus EUPOLYPODIUM

Polypodium sikkimense Hieron.

YUNNAN: East of Tengyueh, in dense forest, at 2,400 meters elevation (7613a).

Polypodium subfalcatum Blume.

Polypodium sinicum Christ, Bull. Herb. Boiss. 7: 3. 1899.

Polypodium convolutum Baker, Kew Bull. Misc. Inf. **1906**: 12. 1906.

Polypodium trichophyllum Baker, loc. cit. 13.

BURMA: Between Sadon and the Yunnan border, epiphytic in mossy forest, at 2,700 meters elevation (7400).

The specimens agree closely with plants collected in Assam by G. Mann, which Beddome, Clarke, and others refer to *P. subfalcatum* Blume, probably with correctness, although the Javanese type differs slightly in its less dense pubescence of long brown hairs. *Polypodium sinicum* Christ and *P. convolutum* Baker are exactly identical, being based upon the same collection number (*Henry* 10186; Kew! Herb. Christ!); *P. trichophllum* Baker, also from the forests of Mengtze (*Hancock* 153; Kew!) is the same, only the fronds are longer (up to 30 cm.), with the pinnae more distant. The specimens of the Rock collection differ a little from these in their relatively long stipes (3 to 4 cm.).

Subgenus GONIOPHLEBIUM

Polypodium manmeiense Christ, Bull. Herb. Boiss. 6: 870. 1898.

Polypodium scalare Christ, Mém. Soc. Bot. France 1: 14. 1905.

Polypodium pseudodimidiatum Christ, Mém. Soc. Bot. France 1: 14. 1905.

Polypodium simulans Baker, Kew Bull. Misc. Inf. 1906: 13. 1906.

YUNNAN: Between Tengyueh and Lungling (7241). Near Ngaza, west of Likiang (10558). Litiping Range, east of Weihsi (11559).

This is no doubt a free-veined *Goniophlebium*, in general aspect very like some forms of *P. vulgare*. On the other hand it comes very near *P. microrhizoma* Clarke, but the blades are narrower and the rachis is stramineous beneath. These and certain other Asiatic species of *Goniophlebium* afford a strong basis for my opinion that our common *P. vulgare* is a free-veined *Goniophlebium*, and not closely related to any group of the subgenus *Eupolypodium*.

Polypodium microrhizoma Clarke.

YUNNAN: Eastern slopes of the Likiang Snow Range (5892, 6498).

In this species the veins are as a rule free, but occasionally they anastomose, forming goniophlebioid areoles. It is a larger fern than *P. manmeiense*, and well marked by the rachis being castaneous beneath.

Polypodium lachnopus Wall.

YUNNAN: Mount Schwemenkan, northwest of the Likiang Snow Range, at 2,100 meters elevation (9789).

Polypodium amoenum Wall.

Polypodium yunnanense Franch. Bull. Soc. Bot. France **32**: 29. 1885.

Polypodium bonatianum Brause, Hedwigia **54**: 207. *pl. 4, L.* 1914.

Polypodium amoenum var. *pilosa* Rosenst. Repert. Sp. Nov. Fedde **13**: 134. 1914.

YUNNAN: Salween watershed, en route from Pingpo to Youngchang and Tengyueh; epiphytic (7003, 7036, 7065). Between Tengyueh and Lungling (7152, 7153, 7180). Hsiao Ping Ho, east of Tengyueh (7719).

BURMA: Between Sadon and the Yunnan border (7455).

The most common Chinese form of this species is rather densely and softly glandulose-pubescent throughout and has been described as a distinct species by Franchet and by Brause, as a variety by Rosenstock. The beautiful series of specimens gathered by Mr. Rock shows, however, that this hairy form can not be separated from the more glabrous Himalayan type; the density of pubescence is due very largely to age.

Polypodium argutum Wall.

Polypodium mengtzeense Christ, Bull. Herb. Boiss. **6**: 869. 1898.

Polypodium aspersum Baker, Kew Bull. Misc. Inf. **1898**: 231. 1898.

BURMA: Between Sadon and the Yunnan border (7500).

In an examination of the type specimens of the species described in the same year by both Christ and Baker (*Henry* 9054) I have tried in vain to find real differences between their plant and specimens of undoubted *P. argutum* from Himalaya, among the latter a cotype in the Copenhagen Herbarium. The original specimen of *P. aspersum* Baker, at Kew, is evidently somewhat abnormal, with irregular venation and irregularly scattered sori. The two or three uppermost pairs of pinnae are confluent at base with the terminal pinna, as is often the case in typical *P. argutum*, for example, in our specimen from Wallich. In the Rock material all the pinnae bear an auricle at the lower base; in the lowest pinnae it is much prolonged, like a secondary pinna.

Subgenus PLEOPELTIS

The numerous Chinese forms of this subgenus (here regarded in the sense of my Index Filicum), with simple fronds, have been very differently identified by authors. The prevailing confusion was, however, greatly reduced by H. Takeda, who published in 1915 a revision [47] of these species. Having examined the type specimens of most of the species described by Baker and by Christ, and having compared them with the large series collected by Cavalerie, Esquirol, H. Smith, and now more recently by Mr. Rock, I find Takeda's delimitation of the species very satisfactory on the whole. In the following list I refer, therefore, repeatedly to his paper, noting where I have a different view and giving supplementary remarks where needed.

Polypodium lineare Thunb.; Takeda, Notes Bot. Gard. Edinburgh **8**: 268. 1915 (excl. var. *loriforme*).

f. **thunbergiana** (Kaulf.) Takeda, loc. cit.

YUNNAN: Western slopes of the Likiang Snow Range, on rocks (5400).

BURMA: Between Sadon and the Yunnan border, on trees (7421).

f. **thunbergiana** (Kaulf.) Takeda, loc. cit.

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,150 meters elevation, on rocks (3387). Western slopes of the same range, at 3,300 meters elevation (4157).

f. **caudato-attenuata** Takeda, op. cit. 269?

BURMA: Between Sadon and the Yunnan border (7509).

YUNNAN: West of Talifu (6870). Identification doubtful.

Polypodium oligolepidum Baker (Takeda, op. cit. 276).

Polypodium trabeculatum Copel. Philippine Journ. Sci. Bot. **3**: 283. 1908.

BURMA: Between Sadon and the Yunnan border; epiphytic (7494, 7498).

This species differs from *P. lineare* chiefly in its rhizome scales, which are lanceolate-acuminate and ciliate, with a dark brown central stripe and light

[47] Notes Bot. Gard. Edinburgh **8**: 265–312.

brown edges; the stipe is very short (not almost black, as stated by Takeda); the lamina is broader and shorter than in *P. lineare*, the upper side distinctly nigro-punctate, the under side with numerous ovate-cuspidate small scales; the sori are large, globose, situated near the midrib, and even at maturity are partly covered with peltate scales.

I have compared specimens from the type collection of *P. trabeculatum* Copel. from Kwantung, received from Dr. C. G. Matthew, with the meager type from Kiu-kiang, at Kew, and find them identical. Other typical specimens from Kweichou (*Cavalerie* 1579) were received from Professor Rosenstock under the name *P. lineare* var. *heterolepis* Rosenst., but evidently they do not belong to that variety, which was described by Rosenstock on specimens from Sikkim and is referred by me to *P. loriforme* (see below).

The Burmese specimens gathered by Rock are not typical, being intermediate between *P. oligolepidum* and *P. lineare*. They resemble the former in scale structure and general aspect, but the sori are about medial and the lower surfaces (the sori excepted) naked.

Polypodium loriforme Wall. List, no. 271. 1828; Mett. Abh. Senckenb. Ges. Frankfurt 2: 92. *pl. 1, f. 50*. 1857.

Polypodium subimmersum Baker, Kew Bull. Misc. Inf. **1895**: 55. 1895; Takeda, op. cit. 275.

Polypodium xiphiopteris Baker, Kew Bull. Misc. Inf. **1906**: 13. 1906.

Polypodium mengtzeanum Baker, Kew Bull. Misc. Inf. **1906**: 14. 1906 (*fide* Takeda).

Polypodium lineare var. *loriforme* Takeda, op. cit. 272.

YUNNAN: En route from Pingpo to Tengyueh (7020). Between Tengyueh and the Burmese border (7303).

Although Takeda refers Wallich's *P. loriforme* to *P. lineare* as a variety, he nevertheless maintains *P. subimmersum* Baker as a species. I have compared a specimen from Wallich's type collection (Herb. Copenhagen) with authentic specimens of *P. subimmersum* and find them nearly identical, except that *P. subimmersum* (which is the same as *P. xiphiopteris* Baker) has the margins of the blade slightly sinuate, with a sorus near each sinus. Rock's specimens, above cited, are typical *P. loriforme*.

Polypodium loriforme seems to me abundantly different from *P. lineare*. The fronds are longer (up to 40 cm.), 1 cm. broad or a little more, and very gradually narrowed downward into a short stipe (2 to 5 cm. long); the blades are generally wrinkled longitudinally in a dried state, the margins narrowly revolute. The lower surfaces are naked or bear occasionally a few minute, ovate, clathrate scales in the lower part near the costa. The sori are intramarginal, linear when young, and covered with peltate scales, with age globose and devoid of scales, slightly immersed, always much more distant than in *P. lineare*.

The rhizome scales resemble those of *P. lineare*, but in reality are quite different. They are ovate-acuminate, nearly black, and coarsely clathrate; all cells nearly isodiametrical, with clear lumina and strong black walls; margins short-dentate from the protruding cross-walls of the marginal cells, not long-ciliate as in *P. lineare*.

To this species I refer a series of somewhat different forms, distinguished from the typical form by their narrow, long-acuminate blades, which are only 5 to 8 mm. broad. Further material will prove, I think, that these narrow-leaved forms belong to different species.

Polypodium loriforme f. angustifrons (Takeda) C. Chr.

Polypodium subimmersum f. *angustifrons* Takeda, op. cit. 276.

YUNNAN: Shweli-Salween watershed east of Tengyueh, altitude 2,400 meters; epiphytic (7599).

SOUTHEASTERN TIBET: Forests of Doyan Longba, altitude 3,000 meters (11630).

This form differs from the type in its narrow leaves only. Closely related to it and differing only in having the sori medial or even inframedial are the following two collections:

YUNNAN: Between Tengyueh and the Burmese border (7306).

SOUTHEASTERN TIBET: Mount Kenyichunpo, Champutong (11519).

Polypodium loriforme var. steniste (Clarke) C. Chr.

Polypodium lineare var. *steniste* Clarke, Trans. Linn. Soc. II. Bot. 1: 559. 1880.

Polypodium subintegrum Baker, Kew Bull. Misc. Inf. 1898: 231. 1898, not Baker, 1877.

Polypodium oblongisorum C. Chr. Ind. Fil. 549. 1906.

Specimens of the type collection of *P. subintegrum* Baker (*Henry* 9194; Kew! Herb. Christ!) differ from narrow forms of *P. loriforme* only in the sori protruding beyond the margin; and since Clarke describes his var. *steniste* as "Fronds 11 by 1/6 in.; sori large, appearing as projections on the margin," and as Takeda (loc. cit. 273) places *steniste* as a form of *P. loriforme*, I have no doubt that *P. subintegrum* Baker is the same.

Polypodium loriforme var. heterolepis (Rosenst.) C. Chr.

Polypodium lineare var. *heterolepis* Rosenst. Repert. Sp. Nov. Fedde 12: 247. 1913.

A variety with large, medial, globose or oblong sori, which touch the costa as well as margin. It differs from the former varieties by its discolorous rhizome scales, which have a distinct dark central stripe and bright brown edges.

YUNNAN: Between Tengyueh and Lungling (7168). Below Kuyung (7558).

Polypodium neurodioides C. Chr., nom. nov.[45]

Neurodium sinense Christ, Bull. Herb. Boiss. 6: 880. 1898. Not *Polypodium sinense* Christ, 1905.

Paltonium sinense C. Chr. Ind. Fil. 477. 1906.

Lemmaphyllum sinense C. Chr. Dansk Bot. Arkiv 6[3]: 51. 1929.

For a long time I have had serious doubts whether this species, one of the marvels ascribed by Christ to the Chinese fern flora, really belonged to the genus *Paltonium*, which otherwise was known as exclusively American. The specimens gathered by Mr. Rock and now under examination have shown it to be so closely related to the species of the group of *Polypodium lineare* that it must naturally be placed here. The truly lanceolate-acuminate frond of the type specimen resembles in size, shape, and texture some of the forms of

[45] In my recently published review of the "drymoglossoid" genera (Dansk Bot. Arkiv 6[3]: 1–93. *pl. 1–13.* 1929), worked out after my manuscript of the present paper was sent to Doctor Maxon, I have made *Polypodium neurodioides* a member of the genus *Lemmaphyllum*, as *L. sinense* (Christ) C. Chr., citing it as an unpublished name. Inasmuch as this species may be placed in *Polypodium* quite as naturally as in *Lemmaphyllum*, I prefer to let the present treatment stand unchanged, as originally written.

P. lineare, but the sori form two continuous or intermittent narrow lines from the middle of the blade nearly to the apex, 1 to 2 mm. within the margins; when young they are covered with peltate scales, as in other species of this group. The underside of the blade is sparsely furnished with ovate-acuminate, toothed, clathrate scales along the lower part of the costa. The hidden venation is that of this group. The scales of the creeping rhizome are ovate, broadly acuminate, fuscous, dark brown at the center, the edges bright brown, ciliate, much resembling those of *P. oligolepidum* or of *P. loriforme* var. *heterolepis*.

The species is a variable one, and I distinguished the following four forms:

1. (Typical). Blade lanceolate, 1 to 1.5 cm. broad below the middle; sorus lines continuous or nearly so.

YUNNAN: *Henry* 10434, 13072. Between Tengyueh and the Burmese border; epiphytic (*Rock* 7365).

BURMA: Between Sadon and the Yunnan border (*Rock* 7488).

2. Blades typical in shape, but the sori polypodioid, globose or somewhat oblong. Distinguished from *P. lineare* principally by its discolorous rhizome scales and its broader, lanceolate blades.

YUNNAN: Between Tengyueh and Lungling, on trees (7113).

3. Blades narrower, 5 to 8 mm. broad, of a more linear type, in outline closely resembling the narrow forms described under *P. loriforme;* sorus lines continuous.

YUNNAN: Mengtze (*Henry* 11518A; Herb. Christ).

4. Similar to the last, but sorus lines interrupted into many oblong or linear sori (sometimes 1 to 1.5 cm. long); resembling closely *P. loriforme* var. *heterolepis* also in scale structure, differing from it chiefly by its linear, often confluent sori.

NORTHWESTERN YUNNAN: Alpine regions of Silo, above Tseku and Tsehchung (8727).

Polypodium excavatum Bory (Takeda, op. cit. 279).

YUNNAN: Eastern slopes of the Likiang Snow Range, at 3,300 meters elevation (5887; f. *bicolor* Takeda). West of Talifu, Mount Yu Hua Ko (6677; f. *concolor* Takeda).

Polypodium macrosphaerum Baker, Kew Bull. Misc. Inf. **1895**: 55. 1895.

Polypodium asterolepis Baker, Journ. Bot. Brit. & For. **26**: 230. 1888; Takeda. op. cit. 283. Not *P. astrolepis* Liebm. 1849.

Polypodium aspidiolepis Baker, Ann. Bot. **5**: 474. 1891. (err. typ.).

Polypodium intramarginale Baker; Christ, Bull. Herb. Boiss. II. **3**: 509. 1903; Baker, Kew Bull. Misc. Inf. **1906**: 13. 1906.

YUNNAN: West of Talifu (6869). Between Tengyueh and Lungling; epiphytic (7103, 7225). Between Tengyueh and the Burmese border (7283). Between Kambaiti and Tengyueh (7538).

SOUTHEASTERN TIBET: Salween watershed below Shundsongla, altitude 3,000 meters (11631).

This is a variable species, especially as to size, but is easily recognized by the obtuse scales of the rhizome. The underside and young sori are covered with many peltate scales; the large globose sori are generally near the margin, but in some specimens they are medial. Specimens from Shensi (*Purdom* 95) reported [49] by me as *P. oligolepidum* may now be referred here, although they are somewhat different.

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[49] Bot. Gaz. **56**: 332. 1913.

Polypodium sublineare Baker (Takeda, op. cit. 276). PLATE 22

BURMA: Between Sadon and the Yunnan border; epiphytic, in dense forest (7424, 7502).

The Rock specimens agree closely with the type from Yunnan (*Henry* 9062A; Kew!): Rhizome scales blackish brown, ovate-acuminate, with very large, uniform, thick-walled cells; margins distantly short-ciliate, not freely long-ciliate as in *P. lineare*.

This is a much larger species than *P. lineare;* the subfasciculate coriaceous fronds are nearly sessile, 3 to 5 cm. broad at the middle, and bear no scales on the surfaces. The large sori are exactly medial and confined to the upper half of the blade, and according to Takeda have peltate scales when young. In habit the plant is much more like *P. excavatum* than *P. lineare*, but the texture is much thicker and the scales are entirely different. The distinctions between this species and the very similar *P. sordidum* are noted under that species.

EXPLANATION OF PLATE 22.—*Polypodium sublineare.* The type specimens, *Henry* 9062A, from Yunnan, in the Kew Herbarium. Two-fifths natural size.

Polypodium sordidum C. Chr., sp. nov.

Rhizome rather short-creeping, firm, blackish, about 3 mm. thick, with a mass of fibrous roots, the younger parts clothed with black, lanceolate-acuminate, sparingly short-toothed scales, the lumina of the cells very small and narrow, here and there brownish and forming irregular brown stripes (especially in the center), the scales often being nearly opaque. Fronds approximate, sometimes 5 or 6 within a space of 3 cm., articulate to short cylindrical pseudopodia from the rhizome; stipes 7 to 15 cm. long, greenish-stramineous, sulcate above, glabrous; blades entire, lanceolate, 25 to 35 cm. long, 2.5 to 4 cm. broad below the middle, cuneate and short-decurrent at base, acuminate at apex, coriaceous, grayish green, paler beneath, perfectly glabrous, the midrib below with a few deciduous, black, ovate, acute scales; veins hidden; sori uniserial in the upper half of the lamina, supramedial, globose, large (about 4 mm. in diameter), superficial, provided with black, lacerate, clathrate scales and filiform paraphyses.

YUNNAN: Between Man Lo and Lungling, in forest, on mossy banks (7160; type). Banks of the Taho, near Kambaiti, on mossy bowlders (7537).

A large species, habitally resembling *P. sublineare* and *P. macrosphaerum*, differing from both by its black nearly opaque rhizome scales, and from *P. sublineare* moreover in its relatively long stipes and supramedial sori.

Polypodium subrostratum C. Chr.

YUNNAN: Kin Tung Chai, between Keng Hung and Muang Hing; climbing on tree trunks in stream bed (2690).

BURMA: Between Sadon and the Yunnan border, on bowlders (7493).

Polypodium rhynchophyllum Hook.

BURMA: Betwen Sadon and the Yunnan border, Valley of Kambaiti (7513).

YUNNAN: Between Kambaiti and Tengyueh (7535, 7557).

Polypodium chrysotrichum C. Chr., sp. nov. PLATE 23

Rhizome creeping on tree trunks, filiform, 1 mm. thick, ramose, whitish-pruinose, paleaceous at first; scales small, brown, peltate, narrowed from a broad ovate sublacerate base into an entire hairlike tip (2 to 3 mm. long). Fronds scattered, conform, the stipes very slender, glabrous, 1 to 3 cm. long (rarely 4 to 5 cm.). Sterile blades ovate-oblong, entire, the larger ones 5 to 7 cm. long, 2 to 2.5 cm. broad, at base rounded and often subcordate, acuminate at apex, the tip short-caudate. Fertile blades similar in shape but smaller,

3 to 4 cm. long by 8 to 10 mm. broad, subcoriaceous, light green above, glaucescent or grayish green beneath, entire (the edges cartilaginous, narrowly revolute), glabrous above, beneath bearing rather numerous, extremely small, glandular, club-shaped, appressed hairs, these consisting of 2 or 3 clear cells (forming a shaft) and 1 much larger, terminal, golden-yellow cell (fig. e); lateral veins about 10 pairs, 6 to 8 mm. apart, lightly flexuous, diverging from the slender costa at an angle of 70°, distinct nearly to the margin, connected by 3 or 4 transverse flexuous veins, these cross veins giving rise to 1 or 2 simple or furcate, recurved veinlets with clavate tips, free, or sometimes united with each other or with the next cross vein; transverse veins of fertile blades commonly connivent at the middle and there connected by a soriferous veinlet (fig. c); sori borne in a single row on each side of the costa, exactly round, rather large (2.5 to 3 mm.), often confined to the lower half of the blade, never extending to the tip; sporangia with 2 to 4 stiff septate hairs, these borne from the upper lateral cells of the sporangium (not from the annulus), protruding above the sporangia (figs. f, g).

YUNNAN: Salween Valley, east of Tengyueh, altitude 2,400 meters; climbing on tree trunks (7656, type).

This new species is a most interesting and distinct one. In general habit and in size it is intermediate between *P. rhynchophyllum* and *P. griffithianum*, resembling the latter in texture and color, the former in size and venation. Aside from the position of the sori in the lower part of the blade, it differs from both these species, however, in the peculiar microscopical glandular hairs of its underside and in its pilose sporangia; in the latter characters it is abundantly different from all other species of this group known to me.

EXPLANATION OF PLATE 23.—*Polypodium chrysotrichum*. The type specimen, *Rock* 7656. a, Three fronds, attached to rhizome (natural size); b, venation of sterile blade (enlarged); c, venation of fertile blade, the limits of the sori faintly indicated (enlarged); d, rhizome scale (much enlarged); e, glandular hair from underside of blade (greatly enlarged); f, g, sporangia (greatly magnified).

Polypodium griffithianum Hook.

Polypodium majoense C. Chr. in Léveillé, Cat. Pl. Yun-Nan 108. 1916.

YUNNAN: Route from Pingpo to Youngchang and Tengyueh; epiphytic (7045, 7067). Between Tengyueh and the Burmese border; epiphytic on forest trees (7305). Between Kambaiti and Tengyueh; epiphytic (7555). East of Tengyueh, Salween ridge; epiphytic (7715).

BURMA: Between Sadon and the Yunnan border; epiphytic (7528).

Polypodium normale D. Don (Takeda, op. cit. 286).

YUNNAN: Between Tengyueh and Lungling; epiphytic (7150). Between Tengyueh and the Burmese border; epiphytic (7358).

BURMA: Between Sadon and the Yunnan border; epiphytic (7510).

Polypodium hymenodes Kunze, Linnaea **23**: 279, 319. 1850; Takeda, op. cit. 287.

YUNNAN: Between Tengyueh and the Burmese border; epiphytic (7366).

Polypodium superficiale Blume.

Polypodium nigrocinctum Christ, Bull. Herb. Boiss. **6**: 874. 1898.

YUNNAN: Between Tengyueh and the Burmese border; epiphytic (7270, 7359). East of Tengyueh (7714).

BURMA: Between Sadon and the Yunnan border (7497).

Polypodium membranaceum D. Don.

YUNNAN: Near Talifu, in the Yangpi Range (6281). Between Tengyueh and Lungling (7100, 7137). Near Ngaza, west of Likiang (10559).

BURMA: Between Sadon and the Yunnan border (7478).

Polypodium punctatum L.

BURMA: Keng Tung Territory, Valley of the Meh Len; epiphytic (2138).

YUNNAN: Between Chieng Law and Muang Hun; epiphytic (2368).

Polypodium dactylinum Christ.

YUNNAN: Mountains above Tseku and Tsehchung, at an elevation of 3,300 meters (11593).

This species has been referred by Takeda (op. cit. 300) to *P. hastatum* Thunb., but it seems to me well characterized by its glaucous, coriaceous, pedately divided blades, with 5 to 7 lobes. The beautiful specimens collected by Mr. Rock agree excellently with the type specimens in Christ's herbarium, although somewhat smaller. The characteristic distant notches in the thickened margins, seen in all forms of the variable *P. hastatum*, are very indistinct in our specimens.

Polypodium veitchii Baker (Takeda, op. cit. 296, with synonymy).

YUNNAN: Eastern slopes of the Likiang Snow Range (5893, 6040, 6048).

I follow Takeda in referring *Polypodium glaucopsis* Franch., from Yunnan, and *P. shensiense* Christ, from Shensi, to the Japanese *P. veitchii*. This is a variable species as to texture, number, shape, and serrature of the segments, as well as to structure of the rhizome scales. The scales may be concolorous and nearly entire; but more commonly they are brown or blackish in the center, with the margins pilose-ciliate. The number of lateral segments varies between 1 and 5 pairs; commonly they are very obtuse, but sometimes acute; the lowest pair are generally excised at the lower base, making the whole blade cordate with a broad open basal sinus, but sometimes they are broadly adnate and short-decurrent. The margins of the form occurring in Yunnan (*P. glaucopsis* Franch.) are distinctly serrulate and often with distinct cuspidate teeth (especially toward the apex), like those of *P. malacodon* Hook., though much shorter. In reality, the specimens gathered by Mr. Rock seem to show that there is not to be found any reliable difference between the Himalayan *P. malacodon* and *P. veitchii* f. *glaucopsis*. See also under the next species.

Polypodium crenato-pinnatum Clarke (Takeda, op. cit. 297).

YUNNAN: Saba, eastern slopes of the Likiang Snow Range; altitude 3,150 meters (6123).

The specimens agree closely with the type of *Polypodium pseudo-serratum* Christ, which was correctly reduced by Takeda to a form of *P. crenato-pinnatum*. They differ from *P. veitchii* by their darker, firm, nearly entire rhizome scales and by their acute or acuminate segments, which are more or less crenate-lobate or even irregularly pinnatifid; but I have serious doubt whether these characters are constant, and am inclined to think that there is no important difference between this species and *P. veitchii*.

Polypodium cyrtolobum Clarke (Takeda, op. cit. 298).

YUNNAN: Western slopes of the Likiang Snow Range, near Ganhaitze; altitude 3,000 meters (4137).

Polypodium trisectum Baker, Kew Bull. Misc. Inf. 1898: 232. 1898; Takeda, op. cit. 295.

Polypodium podobasis Christ, Bull. Acad. Géogr. Bot. 11: 215. 1902 (*Henry* 13121!).

YUNNAN: Between Tengyueh and Lungling (7179, 7181, 7186).

Very closely allied to *P. oxylobum*, from which it is best distinguished by the underside, especially the costae, being minutely glandulose-pubescent. Well developed fronds bear two patent or rather ascending basal lobes, these as a rule much shorter than the central one; but in smaller plants (e. g., 7181) the fronds may be entire or with one or two short basal auricles only. The

rhizome scales resemble those of *P. oxylobum;* they are fulvous, lanceolate-acuminate, and lanose-ciliate.

Polypodium oxylobum Wall. (Takeda, op. cit. 299).

YUNNAN: West of Talifu, en route to Tengyueh (6664). Salween Ridge, en route from Pingpo to Tengyueh (7066). Between Tengyueh and Lungling (7169).

Polypodium ebenipes Hook. (Takeda, op. cit. 300).

YUNNAN: West of Talifu, en route to Tengyueh; altitude 2,400 meters (6678).

A form of this species approaching *P. oxylobum,* from which it differs in its reflexed basal pinnae and slightly serrulate margins. The blade is cordate at base, with a very narrow sinus. The rhizome scales are lanose-ciliate, as in the type. The rhizome is much more strongly glauco-pruinose than in *P. oxylobum.*

Polypodium euryphyllum C. Chr.

BURMA: Keng Tung Territory, Valley of the Meh Len, in dense shade (2135).

Polypodium tatsienense Franch. & Bur.

YUNNAN: West of the Mekong, en route from Pingpo to Tengyueh, on moist bank (7060, 7061).

Identified from Christ's description. The rhizome is creeping and is covered with patent, brown, hair-pointed, short-dentate scales; in no. 7061 there are 1 or 2 pairs of lateral pinnae below the larger terminal one, but in no. 7060 the blade is simple, quite like the terminal pinna of no. 7061. The upper surface is white-dotted with secernated lime; the undulate margins are bordered by a narrow cartilaginous membrane, as in *P. wallichianum;* and the sori and texture are as in that species.

It is possible that *P. tatsienense* is in reality a small form of *P. wallichianum* and perhaps the same as *P. juglandifolium* var. *pauper* Clarke.

Polypodium wallichianum Spreng.

YUNNAN: Between Mohei and Maokai (2954). Between Tengyueh and Lungling (7155). Between Tengyueh and the Burmese border (7304).

Polypodium wallichianum var. **tenuicauda** Hook.

SOUTHEASTERN TIBET: Salween Valley, near Champutong; altitude 2,700 meters; on moss-covered bowlders in stream bed (11510).

Polypodium leiorhizon Wall.

YUNNAN: Between Muang Hai and Keng Hung, on rocks, in forest (2473, 2515). Between Tengyueh and Lungling (7139, 7139a). Fifteen li east of Tengyueh, on bowlders (7875, 7878).

Polypodium lehmanni Mett.

YUNNAN: En route from Pingpo to Tengyueh (7064).

Polypodium lehmanni var. **mairei** (Brause) C. Chr.

Polypodium mairei Brause, Hedwigia 54: 208. *pl. 4, M.* 1914.

YUNNAN: West of Talifu, en route to Tengyueh (6655, 6675, 6920).

Differs from the type in its more numerous pinnae (6 to 11 pairs), these broadly lanceolate or subelliptic, with often crenate, distinctly cartilaginous margins, the sori frequently confluent, thus approaching *P. himalayense.*

Polypodium wardii Clarke, Journ. Linn. Soc. 25: 99. *pl. 43.* 1889.

YUNNAN: Between Tengyueh and Lungling (7257). Summit of Shweli-Salween watershed, east of Tengyueh (7729).

This very beautiful species can not be united naturally with *P. himalayense,* as by Beddome (Handb. Suppl. p. 98), since it differs in its sori being uniserial between the main veins and its perfectly glabrous surfaces and glabrous

sporangia. Clarke failed to mention the color of the leaf; in our specimens the blades are very beautifully glaucous beneath and bordered with broad hyaline margins; otherwise they agree closely with Clarke's description and figure.

The species is new to China.

Subgenus SELLIGUEA

The validity of *Selliguea* as a genus is subject to great controversy among pteridologists. The gymnogrammoid sori may justify the segregation of this group from the subgenus *Pleopeltis* of *Polypodium;* but in most species, specimens with polypodioid sori are found and these may often be difficult to distinguish from *Polypodium* by any other character. So long as we maintain *Polypodium* in the wide sense now generally accepted, it seems best to me to place *Selliguea* under *Polypodium* as a subgenus.

In recent years a considerable number of species have been described from southern China, Annam, Tonkin, and Malaya. Most of these from central east Asia belong to the narrower subgroup of the well-known *Polypodium ellipticum,* with pinnate or occasionally simple fronds, or to that of *P. digitatum* Baker, with digitate or pedatifid fronds. To the latter should probably be referred most of the very weakly characterized Annamese species described by Christ.

In Mr. Rock's collection only two forms of this subgenus are found, both belonging to *P. ellipticum,* using the name in its wide sense. This collective species includes several apparently distinct forms, the delimitation of which is scarcely possible without extensive material. It seems advisable, therefore, to refer the specimens at hand provisionally to that species.

Polypodium ellipticum Thunb.

Gymnogramme pentaphylla Baker, Kew Bull. Misc. Inf. **1898**: 233. 1898.

YUNNAN: Between Tengyueh and the Burmese border (7329).

This is nearly typical, with 6 pairs of lateral pinnae, the lower ones free and petiolate; rachis winged above only; margins entire or nearly so.

Gymnogramme pentaphylla Baker is a very similar form, with only two pairs of broad pinnae and a larger terminal one. It was described from a poorly fertile specimen (*Henry* 9033; Kew!), but another specimen in Herb. Christ (*Henry* 9033A!) is evidently quite the same, with sori nearly reaching the costa.

Polypodium ellipticum var. undulato-repandum C. Chr. Bull. Acad. Géogr. Bot. **22**: 141. 1913.

YUNNAN: Between Keng Hung and Muang Hing (2643).

Differs from the last in its broad wing, which extends throughout the rachis to the upper part of the stipe. It thus resembles another variety of *P. ellipticum* illustrated by Hooker and Greville (*pl. 6*) as *Grammitis decurrens* Wall., but differs by its dark color and irregularly repand-crenate margins.

I have little doubt that *Polypodium cavaleriei* Rosenst.[50] is a form of this with entire or slightly lobed leaves.

LOXOGRAMME (Blume) Presl

Loxogramme salicifolia Makino, Bot. Mag. Tokyo **19**: 138. 1905.

Gymnogramme salicifolia Makino, Phan. Pter. Jap. Icon. *pl. 34.* 1899.

Polypodium makinoi C. Chr. Ind. Fil. 543. 1906.

Loxogramme duclouxii Christ, Bull. Acad. Géogr. Bot. **17**: 140. 1907.

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[50] Repert. Sp. Nov. Fedde **13**: 134. 1914.

Polypodium succulentum C. Chr. Ind. Fil. Suppl. 63. 1913.

Loxogramme fauriei Copel. Philippine Journ. Sci. Bot. 11: 45. *pl. 3, f. 12.* 1916.

Loxogramme makinoi C. Chr. Ind. Fil. Suppl. Prél. 22. 1917.

YUNNAN: Between Tengyueh and Lungling (7259). Between Kambaiti and Tengyueh (7543).

The large amount of material now available from central and eastern Asia proves that the larger forms usually but incorrectly called *Loxogramme lanceolata* and in recent years segregated under several names by Makino, Christ, and Copeland, all belong to one species, which is intermediate between *L. involuta* (D. Don) Presl and *L. lanceolata* (Swartz) Presl. From the former, taken in the sense of Copeland, this differs in its slender costa, and from the latter, an African species, in its divergent sori. The name here chosen applies undoubtedly to this species, but I suspect that the oldest name actually is *Grammitis involuta* Don,[81] and that Copeland's application of this to the form from southern India originally described as *Grammitis scolopendrina* Bory (*Polypodium scolopendrinum* C. Chr.) is incorrect.

Loxogramme duclouxii Christ differs from the normal form only in having the sori confined to the upper third of the blade.

LEPTOCHILUS Kaulf.

As mentioned above, this genus must be restricted to those Asiatic species having entire fronds with "venatio Anaxeti." In his recent paper on *Leptochilus*, quoted above (p. 291), Copeland refers to *Leptochilus* two species only, *L. axillaris* Kaulf. (the type species) and *L. platyphyllus*, placing the other species of so-called *Leptochilus* in the genus *Campium*, sect. *Heteroneuron*. This treatment seems to me an unnatural one, and I have no doubt that the following species and its immediate allies are more closely related to *L. axillaris* than to the pinnate species of *Heteroneuron*. They are polypodioid ferns, and, as a matter of fact, some of them resemble so closely certain species of *Polypodium* (e. g. *P. ovatum* and *P. zippelii*) that one is tempted to consider them acrostichoid states of *Polypodium* species. It appears, as mentioned below, that such a species as *L. decurrens* occasionally bears rudimentary polypodioid sori on its broad fronds, but it remains unproven that contracted fertile fronds are found in the same individual.

Leptochilus decurrens Blume.

YUNNAN: Between Huang Hun and Muang Hai (2420). Between Keng Hung and Muang Hing (2722). Beyond Muang Hing (2725). Between Mohei and Maokai (2911).

Very variable; in no. 2420 the stalk of the sterile leaf is 25 cm. long, in no. 2722 it measures 2 to 5 cm. The former resembles so closely *Polypodium ovatum* Wall. that it is scarcely possible to distinguish their sterile fronds.

To this species I refer also, with doubt, the two following specimens:

BURMA: Keng Tung Territory, Valley of the Meh Len; very rare (2137, 2170).

In both these specimens very small, polypodioid, apparently rudimentary sori occur on the broad leaves, and contracted linear fertile leaves are absent. Thus the specimens seem to belong to *Polypodium*, but they can not be referred to any known species of that genus. In its long-decurrent nearly exstipitate frond no. 2137 very much resembles *Polypodium zippelii* Blume, but I do not believe it can be that species, the veins being too distinct. In no. 2170 the veins

[81] Prodr. Fl. Nepal. 14. 1825.

are still more elevated and the stipe is longer, the frond closely resembling *P. ensatum* Thunb. in habit.

It is very probable that these two specimens belong to a distinct species, or perhaps two, but I prefer to let them remain in *L. decurrens* for the present, inasmuch as Beddome (Handbook, p. 429) mentions forms of *L. decurrens* from southern India which have polypodioid sori, and which in their long-decurrent blades and straight main veins seem to correspond to *Rock* 2137.

CYCLOPHORUS Desv.

Cyclophorus beddomeanus (Giesenh.) C. Chr.

YUNNAN: Man Lo, between Tengyueh and Lungling; epiphytic (7161). Between Kambaiti and Tengyueh (7703).

Cyclophorus drakeanus (Franch.) C. Chr.

SOUTHEASTERN TIBET: Forests of Doyan Longba, Salween-Irawadi watershed, at 3,000 meters elevation (11653).

In my 1924 paper above quoted I wrongly reduced *C. drakeanus* (Franch.) C. Chr. and *C. inaequalis* (Christ) C. Chr. to synonyms of *C. sheareri;* the present specimens belong to *C. inaequalis.*

Cyclophorus flocculosus (D. Don) C. Chr.

BURMA: Between Sadon and the Yunnan border at Changtifang and Kambaiti; epiphytic (7462, 7490).

Cyclophorus gralla (Giesenh.) C. Chr.

YUNNAN: Weinsi, north to Kangpu, Mekong Valley (11580).

The specimens are considerably larger than the type (*Henry* 9061A), the fronds (stipe included) being 25 to 35 cm. long and 3 to 3.5 cm. broad, the stellate hairs of the under side with shorter branches, resembling those of *C. flocculosus.* The rhizome scales are, however, like those of the type (dark brown or nearly black, with bright, short-toothed margins), and the blade is very long and very gradually decurrent. I think my identification is, therefore, correct.

Cyclophorus pekinensis C. Chr.

YUNNAN: Between Tengyueh and Lungling (7146). East of Tengyueh (7881).

Cyclophorus sticticus (Kunze) C. Chr.

YUNNAN: West of Talifu, en route to Tengyueh (6646). Between Tengyueh and Lungling (7228, 7253). Between Tengyueh and the Burmese border (7313). Between Kambaiti and Tengyueh (7544). Yangtze Valley, near Pei Fing Chiang (11535).

Cyclophorus nudus (Giesenh.) C. Chr.

BURMA: Between Tengyueh and Bhamo (7825, 7847).

Cyclophorus heteractis (Mett.) C. Chr.

BURMA: Between Sadon and the Yunnan border at Changtifang and Kambaiti; epiphytic (7491, 7491a, 7499).

Cyclophorus lingua (Thunb.) Desv.

YUNNAN: Between Kambaiti and Tengyueh (7546).

DRYNARIA (Bory) J. Smith

Drynaria delavayi Christ.

YUNNAN: Eastern slopes of the Likiang Snow Range (4290, 6175). East of Likiang, region of Tungshan (10534).

I am inclined to consider this species a smaller form of *D. propinqua.*

Drynaria propinqua (Wall.) J. Smith.

YUNNAN: Between Tengyueh and Lungling (7097, 7102, 7122).

Drynaria sparsisora (Desv.) Moore.

YUNNAN: Between Muang Hai and Keng Hung (2513). Between Muang Hing and Szemao (2756).

Drynaria coronans (Wall.) J. Smith.

Drynaria esquirolii C. Chr. Bull. Acad. Géogr. Bot. **22**: 139. 1913.

BURMA: Between Muang Len and Muang Hpyak (2033).

If the genus *Drynaria* is to be maintained it seems to me quite unnatural to place in *Polypodium* such species as *P. coronans* and *P. heracleum* as has been done by Diels.

ELAPHOGLOSSUM Schott

Elaphoglossum conforme (Swartz) Schott.

Acrostichum marginatum Wall. List, no. 17. 1828 (nomen nudum); Fée, Mém. Foug. **2**: 31. 1845.

Elaphoglossum fusco-punctatum Christ, Bull. Herb. Boiss. **6**: 867. 1899.

YUNNAN: Salween Ridge, west of the Mekong; epiphytic (7063a, 7685, 7727).

It is possible that further material would show this Himalayan and southern Chinese form (*A. marginatum* Wall.) specifically distinct from the true South African *E. conforme;* still some of the specimens examined come very near to the typical form. *Elaphoglossum fusco-punctatum* Christ (*Henry* 9158!) has the blades rather obtuse at both ends, but otherwise not different; the scales of the blade are sometimes nearly entire, but often stellately fimbriate.

Elaphoglossum yunnanense (Baker) C. Chr.

Acrostichum yunnanense Baker, Kew Bull. Misc. Inf. **1898**: 233. 1898.

YUNNAN: Between Kambaiti and Tengyueh, on rocks near the Taho (7534).

The specimen agrees fully with the type (*Henry* 10310; Herb. Christ!), which Christ in his monograph of the genus says is not unlike *E. petiolatum* (Swartz) Urban. I do not understand this. The plant resembles, it is true, that species in general habit, but it differs widely in the blade being rather densely scaly, with small long-fimbrate scales on both sides (those of the upper side soon abraded) and along the costa beneath, here densely chaffy with reddish fimbriate scales.

MARSILEACEAE

MARSILEA L.

Marsilea minuta L.

YUNNAN: Puerhfu to Mohei (2871).

The specimen is sterile, and the identification therefore doubtful.

EQUISETACEAE

EQUISETUM L.

Equisetum arvense L.

YUNNAN: Between Muang Hing and Szemao (2730).

Equisetum ramosissimum Desf. ?

YUNNAN: Along the banks of the Meh Kong, near Keng Hung (2529).

LYCOPODIACEAE

LYCOPODIUM L.

Lycopodium serratum Thunb.
YUNNAN: Woods of Kao Tien, east of Tengyueh (7868).

Lycopodium casuarinoides Spring.
YUNNAN: West of Mekong, en route to Tengyueh (7055). Between Tengyueh and Lungling (7252). East of Tengyueh (7885).

Lycopodium complanatum L.
YUNNAN: Tsangshan Range, west of Talifu (6362). West of Talifu, en route to Tengyueh (6854). Near Tengyueh (7947).
SOUTHEASTERN TIBET: Region of Champutong (10202).

Lycopodium clavatum L.
YUNNAN: Tsangshan Range, west of Talifu (6371). Hsueh Shan Ting, east of Tengyueh (7637).
SOUTHEASTERN TIBET: Slopes of Champutong Mountain (10189).

Lycopodium cernuum L.
BURMA: Valley of the Meh Len (2077).

Lycopodium hamiltonii Spring.
BURMA: Between Sadon and the Yunnan border (7526).
YUNNAN: Between Tengyueh and the Burmese border (7282).

SELAGINELLACEAE

SELAGINELLA Beauv.

Selaginella involvens Spring.
YUNNAN: Eastern slopes of the Likiang Snow Range (3838).

Selaginella willdenovii (Desv.) Baker.
BURMA: Keng Tung Territory, between Muang Len and Muang Hpyak (2064).

Selaginella doederleinii Hieron.
YUNNAN: East of Tengyueh (7689); det. O. Schmidt.

Selaginella inaequalifolia (Hook. & Grev.) Spring.
BURMA: Keng Tung Territory: Between the Siamese border and Pang Mah Ki Hat (1941); Valley of the Meh Len (2125); det. O. Schmidt.

Selaginella biformis A. Br.
BURMA: Keng Tung Territory, between Muang Len and Muang Hpyak (2038); det. O. Schmidt.

PTERIDOPHYTA FROM NORTHERN SIAM

The collection contains 60 species, nearly all from the mountainous region between Salween and Mekong and adjoining eastern Burma (Keng Tung Territory). Most of the specimens were collected on the summit of Doi Chom Cheng, in the Doi Sootep Mountain Range, at an altitude of 1,500 to 1,650 meters, others in the Doi Chang Mountains. The fern flora of these mountains, as it appears from the following list, resembles very much that of Burma and southern Yunnan, and not a few species from these regions are now recorded for Siam. The tropical Malayan element is, however, somewhat more prominent, and it seems that the genus *Platycerium* here reaches its northern limit.

MARATTIACEAE

Angiopteris helferiana Presl.
Between Meh Soi and Hue San (1848, 1851).

Angiopteris sp.
Doi Chom Cheng (1510). A single sterile specimen.

SCHIZAEACEAE

Lygodium flexuosum Swartz.
Between Ta Kaw and Meh Soi (1674). Between Ban Tong Ha and Ta Kaio (1703). Lower slopes of Doi Chang Mountain, in rain forest (1731, 1734, 1740). Between Ban Hue Bong and the border (1913).

A form with simple pinnules, approaching *L. salicifolium* Presl, was collected on Doi Chom Cheng (191).

Lygodium flexuosum Swartz, var.?
Along the Meh Ping at Soop Chem (557).

A single specimen, different from all forms of *L. flexuosum* known to me; intermediate between that species and *L. scandens*, much resembling the American *L. polymorphum* (Cav.) H. B. K. It differs from *L. scandens* in its straight secondary rachis with only 2 or 3 pairs of tertiary pinnules, these palmately deeply divided into 3 to 5 lobes, the central one the largest, 2 to 4 cm. long; the secondary rachises are winged nearly to the base, as are the petioles of the ultimate segments; fertile pinnules generally less divided and smaller, but nearly always with two broad basal lateral lobes; ribs of the pinnules prominent and slightly hairy, the leaf otherwise glabrous; texture thin.

Lygodium polystachyum Wall.
Between Meh Soi and Hue San (1846, 1852).

Lygodium japonicum Swartz.
Along the Meh Ping at Doi Noi (504). Lad Bua Kao, near Korat (1527).

Lygodium scandens Swartz.
Between Ban Du and Ban Meh Ki (1860).

GLEICHENIACEAE

Dicranopteris linearis (Burm.) Underw.
Upper slopes of Doi Chang Mountain (1756).

HYMENOPHYLLACEAE

Hymenophyllum exsertum Wall. PLATE 24
Summit of Doi Chom Cheng (1517). Upper slopes of Doi Chang Mountain (1757).

EXPLANATION OF PLATE 24.—*Hymenophyllum exsertum*, covering a tree trunk at summit of Doi Chang, Siam, altitude 1,625 meters; *Rock* 1757.

Trichomanes bipunctatum var. **latealatum** (v. d. B.) Clarke.
Summit of Doi Chom Cheng (1518, 1521).
Among the many forms of this species described by Van den Bosch as species, the specimens agree best with his *Didymoglossum latealatum*. This may be distinct; but, so far as my experience goes, the essential character "spurious veins few or many, long or short, with or without an intramarginal one" is more individual than specific. In the present specimens an intramarginal spurious vein is wanting, but many shorter and longer ones are present in the leaf tissue.

POLYPODIACEAE

Dryopteris procurrens (Mett.) Kuntze.
Nephrodium molle var. *aurea* Clarke, Trans. Linn. Soc. II. Bot. 1: 533. 1880.
Dryopteris cylindrothrix Rosenst. Repert. Sp. Nov. Fedde 12: 246. 1913.
On the Wieng Papao plain; stream bed of the Meh Lao (1652).
The specimen is densely glandular beneath with cylindrical hairs, besides longer whitish ones, just as described by Beddome (Handb. Suppl. 67) and Rosenstock. I do not know whether this is the typical form of the species.

Dryopteris pteroides (Retz.) Kuntze.
Rain forests of the lower slopes of Doi Chang Mountain (1716).

Dryopteris hirtisora C. Chr.
Doi Chom Cheng (1511, 1759).
See above (p. 277).

Dryopteris moulmeinensis (Bedd.) C. Chr.
At Pang Kia, headwaters of Meh Lao; altitude 900 meters (1594).

Dryopteris sagenioides (Mett.) Kuntze.
Between Ban Du and Ban Meh Ki (1874).

Dryopteris hirtipes (Blume) Kuntze.
Summit of Doi Chom Cheng (234, 1512).

Polystichum setiferum (Forsk.) Woynar?
Valley of Hue Me Pan (444, 445).
A form intermediate between *Polystichum yunnnanense* Christ and *P. biaristatum* Bl., but the scanty specimens are insufficient for positive identification. In no. 444 the leaf is gemmiferous just below the apex.

Tectaria polymorpha (Wall.) Copel.
Trail from Raheng to Peng Ma Kham Pom (1524). Between Meh Soi and Hue San (1855).

Tectaria rockii C. Chr., sp. nov.

Rhizome not seen. Stipe about 80 cm. long, 5 mm. thick, brownish-stramineous, deeply sulcate above, minutely glandulose-puberulous, bearing at the base a few dark-brown lanceolate scales. Blade broadly deltoid, about 50 cm. long, herbaceous, dark green, bipinnate at base; basal pinnae much the largest, 35 cm. long or more, stalked (5 cm.), basiscopic, with a pair of free pinnules, the lower one of these about 20 cm. long and 3 to 3.5 cm. broad, petiolate (1 cm.), acuminate, crenate-lobate (the lobes triangular and rounded outward, scarcely 1 cm. long), the upper pinnules similar but smaller and merely undulate-crenate; terminal portion of the basal pinna 5 cm. distant from the free pinnules, about 25 cm. long, not decurrent at base, deltoid, in the lower half deeply lobed with 5 or 6 deltoid acuminate segments on each side (the lower ones about 10 cm. long, 2 cm. broad at base), the apical portion 3 cm. broad, undivided, short-lobate, finally undulate-crenate; second pair of pinnae 20 cm. distant from the basal pair, short-stalked (1.5 cm.), about 25 cm. long, 4 cm. broad at base, cut like the terminal portion of the basal pinnae; third pair of pinnae 10 cm. distant from the second, nearly sessile, about 20 cm. long, 4 cm. broad, cut like the lower pinnule of the basal pinnae; terminal portion of the blade about 25 cm. long, cuneate at base, in cutting similar to the terminal portion of the basal pinnae, but the lower segments larger; rachises and larger veins like the stipe, brownish, glossy, minutely glandulose-puberulous beneath; veins anastomosing, forming distinct irregular areoles with or without included free veinlets; sori confined to the ultimate lobes, leaving a broad sterile belt at the middle of the pinnae or pinnules, rather irregularly placed on the netted veins, but in the smaller lobes situated as a rule in a row at either side of the midrib; indusia reniform, brown, persistent, glabrous. Leaf tissue glabrous on both sides.

Western Siam: Between Palut and Nam Dip, on the trail from Raheng to Mesawt, December 17, 18, 1920 (668).

I venture to describe this fern as new, although it is impossible, I think, to be quite sure that it has not previously been published. Very probably, however, it is the plant illustrated by Beddome (Ferns Brit. Ind. *pl. 48*) under the name *Sagenia subtriphylla;* but if so, I can not agree with him. *Tectaria subtriphylla* (Hook. & Arn.) Copel., from eastern China, is much smaller and much more pubescent, and usually has one pair of lateral pinnae only. *T. rockii* comes near some forms of **T. coadunata** (Wall.) C. Chr.,[83] but it is less cut and less hairy. A closely allied species is **Tectaria longicruris** (Christ) C. Chr. (*Sagenia longicruris* Christ), from Kweichou (*Cavalerie* 191D, 3559; *Esquirol* 2252), but that differs in its atropurpureous or ebenous rachises and partly confluent sori.

Tectaria leuzeana (Gaud.) Copel.

Between Meh Soi and Hue San (1849). Between Ban Du and Ban Meh Ki (1873).

The species is here regarded in its broad sense.

Campium costatum (Wall.) Presl.

Leptochilus costatus C. Chr. Bot. Tidsskr. **32**: 344. 1916.

Valley of the Hue Me Pan (229). Summit of Doi Chom Cheng (1503).

Nephrolepis biserrata (Swartz) Schott.

Between Ban Du and Ban Meh Ki (1875).

Leucostegia immersa (Wall.) Presl.

Summit of Doi Chom Cheng (194).

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[83] *Aspidium coadunatum* Wall. List, no. 377. 1828; Hook. & Grev. Icon. Fil. **2**: *pl. 202.* 1831.

Leucostegia pulchra (D. Don) Moore. PLATE 25

Summit of Doi Chom Cheng (359, 361, 362).

EXPLANATION OF PLATE 25.—*Leucostegia pulchra; Rock* 362, climbing high in the trunk of a forest tree.

Leucostegia dareaeformis (Hook.) Bedd.

Summit of Doi Chom Cheng (364, 365, 367).

Microlepia hirta (Kaulf.) Presl.

Between Meh Soi and Hue San (1847).

Microlepia speluncae (L.) Moore.

Trail from Raheng to Pang Ma Kham Pom (1523).

Athyrium dissitifolium (Baker) C. Chr.

Summit of Doi Chom Cheng (366, 369). Valley of the Hue Me Pan (440). See above (p. 296).

Diplazium siamense C. Chr., sp. nov. PLATE 26

Rhizome (incomplete) suberect, densely paleaceous at apex, the scales castaneous, lanceolate, entire. Fronds several, fasciculate, nearly 1 meter long, the stipes up to 50 cm. long, 3 to 4 mm. thick, fuscous and scaly at base, gray-greenish upward with a few scattering deciduous scales, trisulcate above, glabrous; blade broadly ovate or subdeltoid, about 40 cm. long, subcoriaceous, glabrous, dark green above, pale beneath, pinnate (the pinnae pinnatifid), with a rather distinct terminal pinnatifid pinna; free pinnae in 5 or 6 pairs (above these commonly 1 or 2 shorter ones adnate to the rachis), alternate, about 6 cm. apart, long-petiolate (2 to 2.5 cm. in the lower ones), oblong-lanceolate, 20 cm. long, 3.5 to 4 cm. broad, equally short-cuneate at base, incised one-half to two-thirds the distance to the midrib, the apex acuminate, serrate; lobes falcate, 1.2 to 1.5 cm. long, 8 to 9 mm. wide, obtusely rounded, short-serrate; veins in about 8 pairs, mostly forked at the middle, the basal ones always simple, much curved and ascending to the sinus; sori very narrow, not touching the costa, reaching about halfway to the edge; indusia narrow, entire, a few of the lower ones diplazioid.

Summit of Doi Chom Cheng, altitude 1,500 to 1,650 meters, Nov. 1–6, 1920 (438; 1507, type).

Diplazium siamense differs from all related species known to me by its conspicuously long-stalked, few, and broad pinnae. In cutting it most resembles *D. veitchii*, but the color and texture are different and the blade is not gradually, but rather abruptly, narrowed at the pinnatifid apex.

EXPLANATION OF PLATE 26.—*Diplazium siamense*. The type specimen, *Rock* 1507. About one-half natural size.

Asplenium nidus L.

Between Ban Du and Ban Meh Ki (1871).

Asplenium ensiforme Wall.

Summit of Doi Chom Cheng (350, 1500, 1509).

Asplenium planicaule Wall.

Summit of Doi Chom Cheng (461).

Asplenium rockii C. Chr., sp. nov. PLATE 27

Rhizome short-creeping, with numerous black-brown, clathrate, lanceolate, acuminate scales. Fronds several, fasciculate, suberect, 14 to 17 cm. long; stipes 2 to 3 cm. long, like the rachis crinite by numerous narrow, lanceolate, hair-pointed, fimbriate, black-brown scales; blade lanceolate, acuminate, 12 to 15 cm. long, 2.5 to 3 cm. broad at middle, evenly narrowed both ways, sub-

coriaceous, light green, nearly bipinnate; pinnae 15 to 20 pairs, alternate, the largest 1.5 cm. long, short-petiolate, truncate at upper base, cuneate below, pinnately cut to a very narrow costal wing into 3 or 4 pairs of pinnules, the apex rather obtuse, once or twice cleft; pinnules or segments often 4 at the upper, 3 at the lower side of the pinna, the upper basal one the largest, 5 cm. long, cuneate-spatulate, deeply incised, with about 4 obtuse lobes, the other pinnules equally cuneate, with 2 or 3 short obtuse lobes or teeth at the outer edge; costae and larger veins with scattered scales beneath similar to those of the rachis but smaller, suddenly contracted from a lighter, broad, fimbriate base into a long hairlike point; margins revolute; veins indistinct; sori 1 or 2 in each segment, nearly covering it; indusia oblong, grayish, entire.

Summit of Doi Chom Cheng (348, type; U. S. Nat. Herb. no. 1,211,193; also *Rock* 1520, from the same locality.

This small species seems abundantly distinct from all species known from these regions. It is evidently related to the Javanese *A. stereophyllum* Kunze, resembling it in texture and cutting; but that species is much larger, with much longer stipe, and without the peculiar dense scales of stipe, rachis, and costae, which form the most prominent character of our new species. The description is drawn from the largest specimen (no. 348); the other (no. 1520) is much smaller: blade 4 to 5 cm. long, 1 cm. broad; stipe nearly wanting.

EXPLANATION OF PLATE 27.—*Asplenium rockii.* The type specimen, *Rock* 348. Natural size.

Blechnum orientale L.
Trail from Raheng to Pang Ma Kham Pom (1525).

Brainea insignis Hook. PLATE 28
Summit of Doi Chom Cheng (354).

EXPLANATION OF PLATE 28.—*Brainea insignis.* Summit of Doi Chom Cheng, *Rock* 354.

Doryopteris ludens (Wall.) J. Smith.
Lad Bua Kao, near Korat (503).

Pteris pellucida D. Don.
Trail from Pang Ma Khan Pom to Palut, near Raheng (653).

Pteris biaurita L.
At Pang Kia, headwaters of the Meh Lao (1593).

Pteris wallichiana Agardh.
Summit of Doi Chom Cheng (1506).

Pteridium aquilinum (L.) Kuhn.
Rain forests on the lower slopes of Doi Chang Mountain (1716a, 1720).

Vittaria flexuosa Fée.
Summit of Doi Chom Cheng (351) Upper slopes of Doi Chang Mountain, Chiengmai Province (1760).

Polypodium amoenum Wall.
Doi Chom Cheng (151a, 237, 355, 357, 370a).

Polypodium argutum Wall.
Summit of Doi Chom Cheng (151, 370, 449, 455).

All the specimens cited belong to a form which approaches *P. subauriculatum* Blume in having most of the pinnae cordate at base. This is identical with some of the forms referred by Christ to his *P. mengtzeense*, but differs from the type in having only the uppermost pair of pinnae confluent with the terminal pinna.

Polypodium lineare Thunb.?

Summit of Doi Chom Cheng (358).

A variety or perhaps a distinct species, the rhizome scales nearly black, with very narrow cells and bright brown, sparsely ciliate margins.

Polypodium excavatum Bory.

Summit of Doi Chom Cheng (150, 356, 1505). Valley of the Hue Me Pan, Doi Sootep Mountain Range (450, 454).

Polypodium rhynchophyllum Hook.

Summit of Doi Chom Cheng (250, 352, 1502).

Polypodium membranaceum D. Don.

Summit of Doi Chom Cheng (239, 1504).

Polypodium lehmanni Mett.

Summit of Doi Chom Cheng, altitude 1,650 meters (360, 363, 1514). Valley of the Hue Me Pan (446).

Some of these specimens, e. g. no. 360, match exactly a sketch of the type specimen by Mettenius in the Berlin Herbarium. The number of lateral pinnae varies from 4 to 7 pairs.

Polypodium oosphaerum C. Chr., sp. nov. PLATE 29

Rhizome wide-creeping, 6 to 8 mm. thick, densely covered with peltate, imbricate, ovate-acute, entire, sordid-brown scales, these nearly concolorous, the central cell-walls somewhat darker than the rest, most of the cells rectangular, with straight walls, those bordering the edges smaller, irregular, with flexuose walls (about as in *P. excavatum*). Fronds at distances of 2 to 3 cm., the stipes very short, rarely 1 cm. long; blade simple, entire, broadly lanceolate, 40 cm. long, 5 to 6 cm. broad below the middle, thence gradually attenuate to the subacute curved apex, less narrowed downward, about 2 cm. broad at extreme base, here rotund-truncate; leaf tissue light-green, thinly papyraceous, glabrous, the upper side densely fusco-punctate from the hydathodes of the free veinlets; costa yellowish-brown, raised below and there furnished with a few ovate-lanceolate, deciduous scales; primary lateral veins very fine, but distinct two-thirds of the way to the edge, very oblique, 1.5 to 2 cm. apart, the included network of veins very fine but distinctly seen in the dried frond, the areoles with many free veinlets; sori confined to the upper half of the blade, borne in a single row at either side, medial, obliquely elliptic, 6 mm. long, 4 mm. broad, yellowish brown, without peltate scales, but with numerous paraphyses among the sporangia.

Summit of Doi Chom Cheng, Doi Sootep Mountain Range, altitude 1,500 to 1,650 meters, November 1 to 6, 1920 (236, type; U. S. Nat. Herb. no. 1,211,188); also no. 1515, with identical data.

A near ally of *P. excavatum* Bory, differing in its larger and, particularly, its broader frond, which is not decurrent at the very short stipe, in its thin oblique veins, and its large elliptic sori.

EXPLANATION OF PLATE 29.—*Polypodium oosphaerum*. The type specimen, *Rock* 236. Two-fifths natural size.

Polypodium hastatum Thunb.

Summit of Doi Chom Cheng (182).

A small form with two horizontal basal lobes.

Polypodium oxylobum Wall.

Summit of Doi Chom Cheng (195).

Drynaria propinqua (Wall.) J. Smith.

Summit of Doi Chom Cheng (368)

Drynaria quercifolia (L.) J. Smith.
Along the Meh Ping at Doi Noi (512).

Cyclophorus heteractis (Mett.) C. Chr. var. **minor** C. Chr., var. nov.
Summit of Doi Chom Cheng (349, 1508).
Much smaller than the typical form of the species: Stipe 3 cm. long; blade 5 to 6 cm. long, 1.5 cm. broad; in scale characters not different; color bright reddish brown. Probably a local race.

Elaphoglossum conforme (Swartz) Schott.
Summit of Doi Chom Cheng (353, 1516). Upper slopes of Doi Chang Mountain (1768).
The specimens are not typical, differing by the short stipes of the sterile leaves margined almost to the base. See previous entry (p. 327).

Elaphoglossum yunnanense (Baker) C. Chr.
Summit of Doi Chom Cheng (249).

Platycerium wallichii Hook.
Trail from Raheng to Pang Ma Kham Pom (1526).

Platycerium grande J. Smith.
Between Ban Hue Bong and the Burmese border (1922).

LYCOPODIACEAE

Lycopodium hamiltonii Spring.
Summit of Doi Chom Cheng (451).

SELAGINELLACEAE

Selaginella fulcrata (Ham.) Spring.
Along the Meh Ping at Soop Chem (480, 525); det. O. Schmidt.

Selaginella willdenovii (Desv.) Baker.
Between Ban Du and Ban Meh Ki (1863); det. O. Schmidt.

LIST OF NEW SPECIES AND VARIETIES, AND NEW NAMES

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Asplenium rockii C. Chr., sp. nov 332
Athyrium dissitifolium (Baker) C. Chr 296
Polypodium dissitifolium Baker.
Athyrium otophorum (Miquel) Rosenst 298
Asplenium otophorum Miquel.
Athyrium supraspinescens C. Chr., sp. nov 297
Campium sinense (Baker) C. Chr 292
Acrostichum sinense Baker.
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Diplazium sikkimense (Clarke) C. Chr 304
Asplenium sikkimense Clarke.
Dryopteris calcarata var. sericea (Scott) C. Chr 274
Lastrea sericea Scott.
Dryopteris falciloba (Hook.) C. Chr 274
Lastrea falciloba Hook.
Dryopteris henryi (Christ) C. Chr 282
Polystichum henryi Christ.
Dryopteris hirtipes var. atrata (Wall.) C. Chr 278
Aspidium atratum Wall.; Kunze, 1851 (in part?)
Dryopteris hirtipes var. stenolepis (Baker) C. Chr 279
Polypodium stenolepis Baker.
Dryopteris hirtisora C. Chr., sp. nov 277
Dryopteris paleacea var. khasiana (Clarke) C. Chr 280
Nephrodium filix-mas var. *khasiana* Clarke.
Dryopteris speciosa var. assamica (Kuhn) C. Chr 282
Aspidium assamicum Kuhn.
Dryopteris tuberculifera C. Chr., sp. nov 275
Egenolfia appendiculata var. subintegra (Bedd.) C. Chr 291
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Egenolfia helferiana (Kunze) C. Chr 292
Polybotrya helferiana Kunze.
Elaphoglossum yunnanense (Baker) C. Chr 327
Acrostichum yunnanense Baker.
Humata griffithiana (Hook.) C. Chr 293
Davallia griffithiana Hook.
Leucostegia clarkei (Baker) C. Chr 294
Davallia clarkei Baker.
Leucostegia clarkei var. faberiana C. Chr 294
Davallia clarkei var. *faberiana* C. Chr.
Microlepia marginata var. calvescens (Wall.) C. Chr 294
Davallia calvescens Wall.; Hook. 1846.
Microlepia trapeziformis var. rhomboidea (Wall.) C. Chr 295
Davallia rhomboidea Wall.; Kunze, 1850.

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Notholaena delavayi (Baker) C. Chr. 307
Gymnogramme delavayi Baker.
Plagiogyria glauca var. **virescens** C. Chr., var. nov. 310
Polypodium chrysotrichum C. Chr., sp. nov. 320
Polypodium lehmanni var. **mairei** (Brause) C. Chr. 323
Polypodium mairei Brause.
Polypodium loriforme f. **angustifrons** (Takeda) C. Chr. 318
Polypodium subimmersum f. *angustifrons* Takeda.
Polypodium loriforme var. **heterolepis** (Rosenst.) C. Chr. 318
Polypodium lineare var. *heterolepis* Rosenst.
Polypodium loriforme var. **steniste** (Clarke) C. Chr. 318
Polypodium lineare var. *steniste* Clarke.
Polypodium neurodioides C. Chr., nom. nov. 318
Neurodium sinense Christ, 1898. Not *Polypodium sinense* Christ, 1905.
Polypodium oosphaerum C. Chr., sp. nov. 334
Polypodium sordidum C. Chr., sp. nov. 320
Polystichum nepalense var. **subbipinnatum** C. Chr., var. nov. 284
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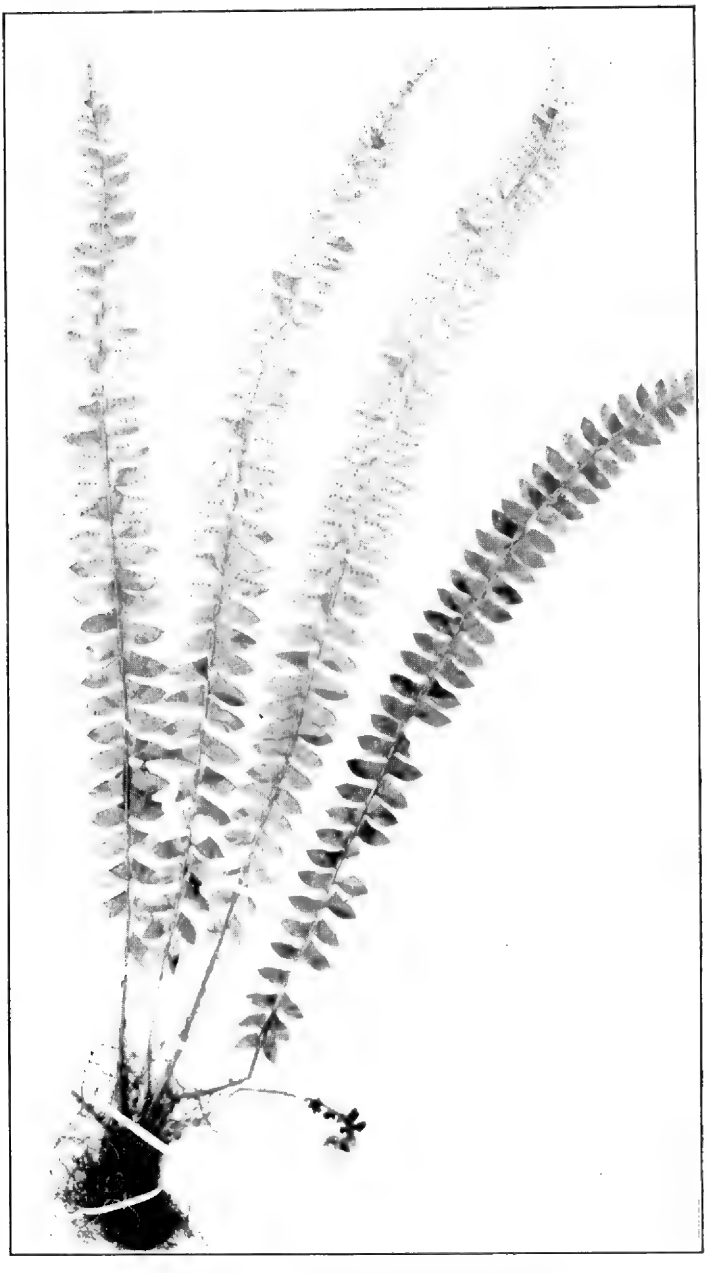
Tectaria austrosinensis (Christ) C. Chr. 290
Dryopteris austrosinensis Christ.
Tectaria coadunata (Wall.) C. Chr. 331
Aspidium coadunatum Wall.; Hook. & Grev. 1831.
Tectaria fuscipes (Wall.) C. Chr. 290
Aspidium fuscipes Wall.; Bedd. 1876.
Tectaria longicruris (Christ) C. Chr. 331
Sagenia longicruris Christ.
Tectaria rockii C. Chr., sp. nov. 331
Tectaria variolosa (Wall.) C. Chr. 289
Aspidium variolosum Wall.; Hook. 1862.

ALSOPHILA GLABRA (BLUME) HOOK.

A. CIBOTIUM BAROMETZ (L.) J. SMITH

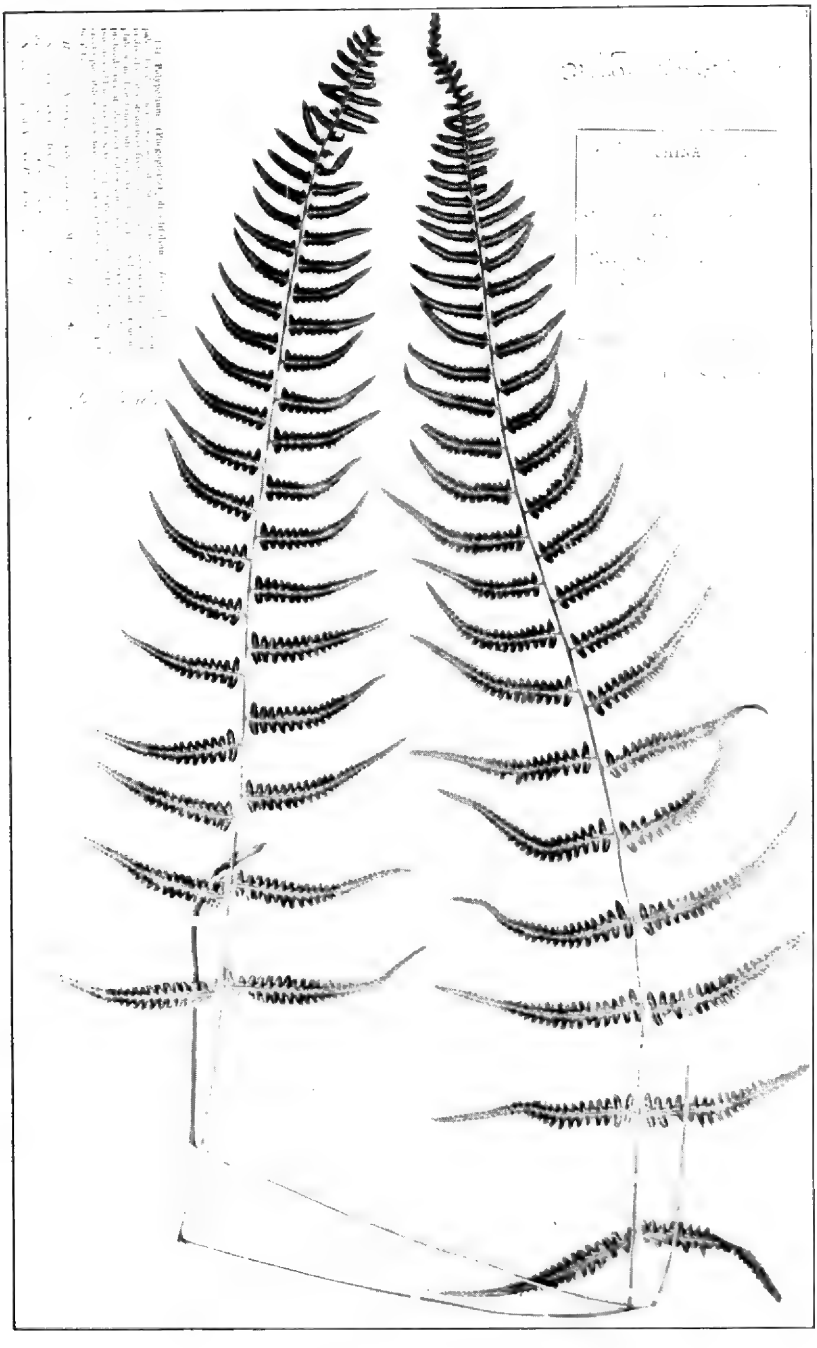
B. CIBOTIUM BAROMETZ (L.) J. SMITH

DRYOPTERIS FARGESII (CHRIST) C. CHR.



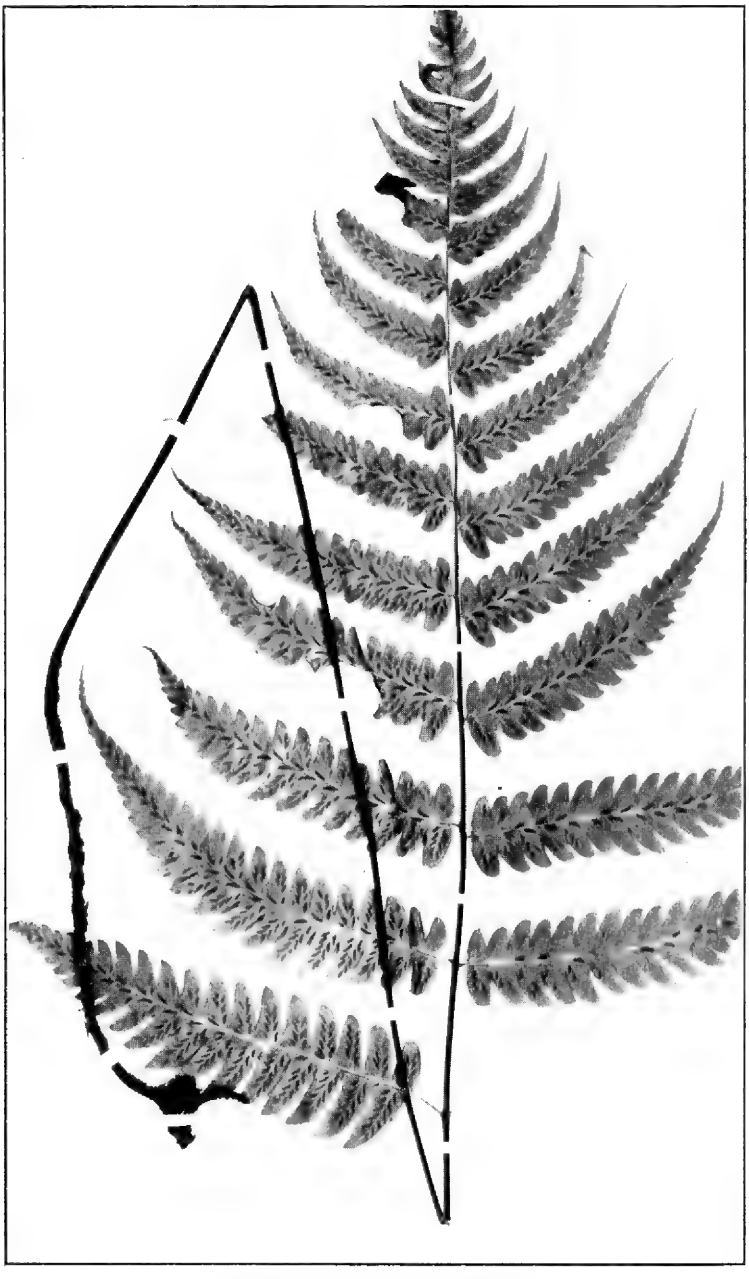
POLYSTICHUM STENOPHYLLUM CHRIST

POLYSTICHUM PUNCTIFERUM C. CHR.



ATHYRIUM DISSITIFOLIUM (BAKER) C. CHR.

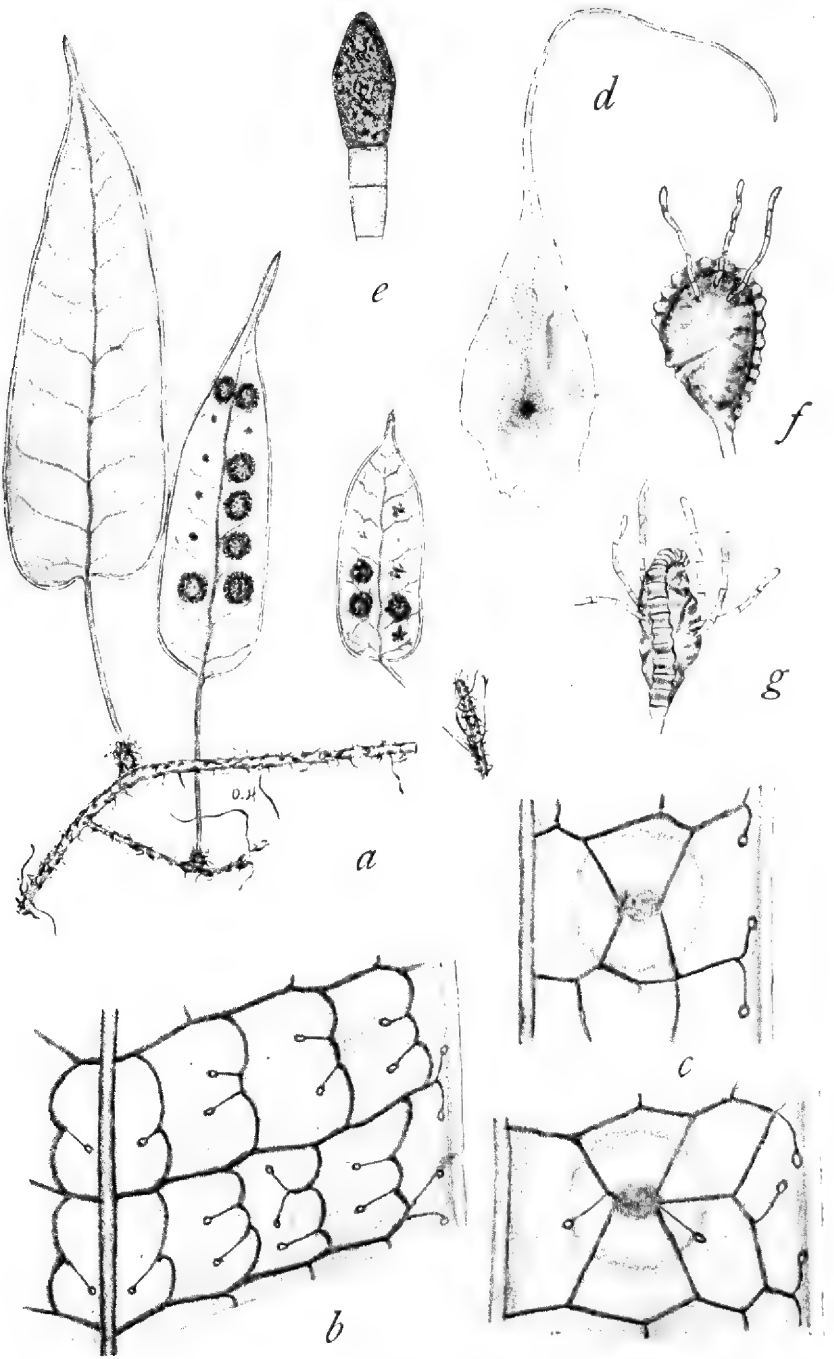
ATHYRIUM SUPRASPINESCENS C. CHR.



DIPLAZIUM VEITCHII CHRIST

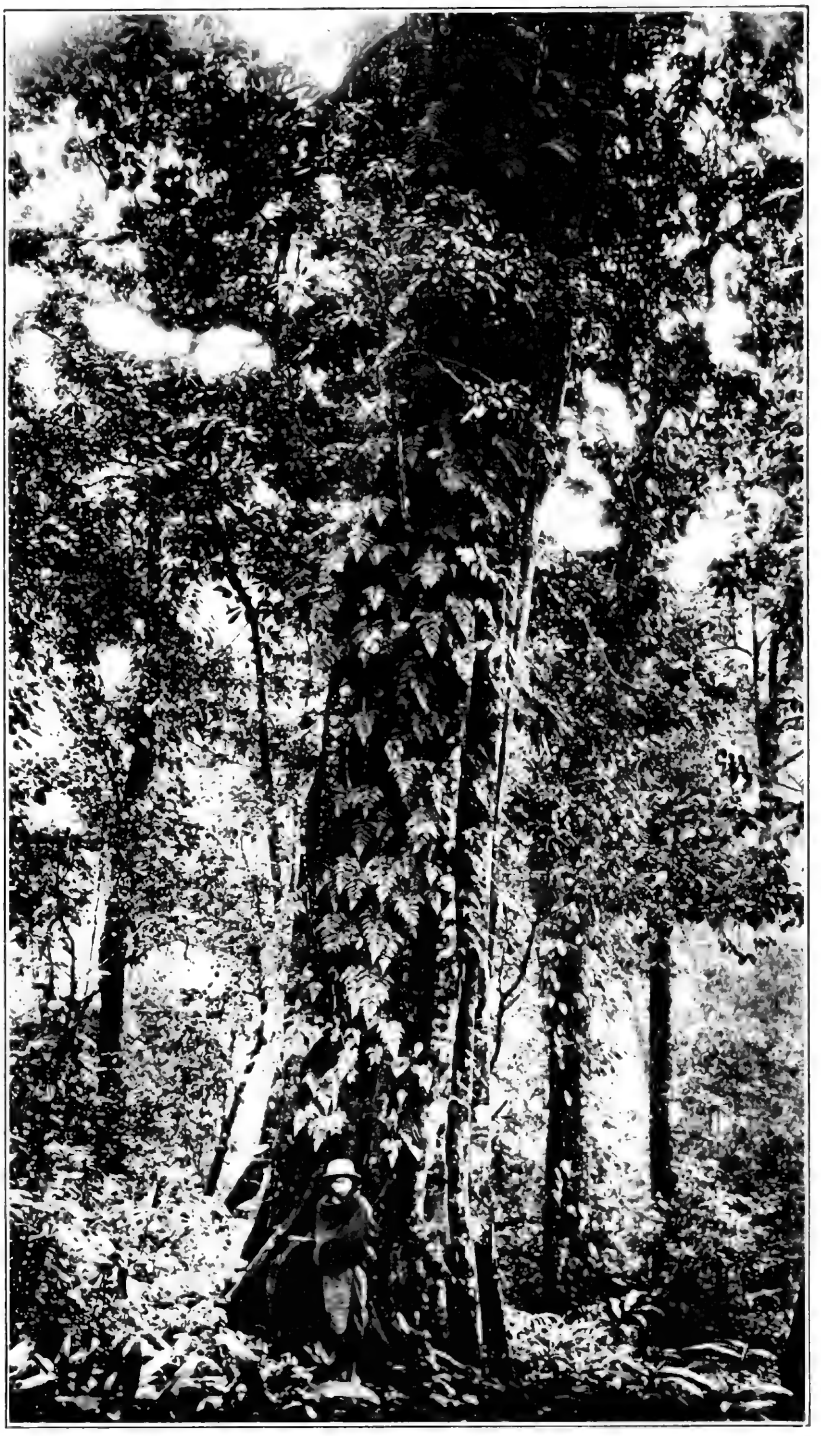
PLAGIOGYRIA HENRYI CHRIST

POLYPODIUM SUBLINEARE BAKER



POLYPODIUM CHRYSOTRICHUM C. CHR.

HYMENOPHYLLUM EXSERTUM WALL



LEUCOSTEGIA PULCHRA (D. DON) MOORE

DIPLAZIUM SIAMENSE C. CHR.

ASPLENIUM ROCKII C. CHR.

BRAINEA INSIGNIS HOOK

POLYPODIUM OOSPHAERUM C. CHR.

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THE MEXICAN AND CENTRAL AMERICAN SPECIES OF VIBURNUM

By C. V. MORTON

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PREFACE

The present paper, entitled "The Mexican and Central American Species of Viburnum," by C. V. Morton, aid in the National Herbarium, is the result of a critical study of material in the larger American herbaria and in the collections of the Botanisk Museum, Copenhagen, and the Royal Botanic Gardens, Kew. With the aid of data furnished by these historic specimens it has been possible to provide a fairly satisfactory treatment of the abundant material collected in recent years, by making use largely of minute characters that have not previously received adequate attention. During the past 70 years only 5 species have been described from Mexico and Central America. In the present revision 30 species are recognized, 10 of which are described as new. In general, they are of rather narrowly limited distribution. None are known to be important economically.

FREDERICK V. COVILLE,
Curator, United States National Herbarium.

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THE MEXICAN AND CENTRAL AMERICAN SPECIES OF VIBURNUM

By C. V. Morton

INTRODUCTION

The genus *Viburnum* is the commonest representative of the family Caprifoliaceae in the American Tropics, but has been generally neglected, nevertheless, probably because of the slight economic importance of the plants and the remoteness of the type specimens of the early species. Despite an abundance of recently collected material only five new species from Mexico and Central America have been described since Oersted's revision in 1861. The recent work of Killip and Smith on the South American species of *Viburnum* [1] has stimulated the author to attempt a similar revision for the northern region.

In addition to specimens in the United States National Herbarium there has been available also the tropical North American material in the following institutions: University of California (C),[2] Botanisk Museum, Copenhagen (Co), Field Museum of Natural History (F), Gray Herbarium of Harvard University (G), Royal Botanic Gardens, Kew (K), Missouri Botanical Garden (M), and the New York Botanical Garden (Y). The loan of this material, much of it indispensable to a satisfactory understanding of the group, is gratefully acknowledged. Thanks are due also to Dr. Fr. Markgraf, of the Botanisches Museum, Berlin-Dahlem, who very kindly provided notes on the type collections of *Viburnum stellato-tomentosum* Oerst. and *V. stellato-pilosum* Polak.

HISTORY OF THE GENUS

The genus *Viburnum* was established by Linnaeus,[3] to whom, however, none of the Mexican or Central American species were known. Many North American collections have been named errone-

[1] "The genus Viburnum in northwestern South America", Bull. Torrey Club **56**: 265–274. 1929, and "The South American species of Viburnum", Bull. Torrey Club **57**: 245–58. 1931.

[2] The letters in parentheses are abbreviations employed in citing specimens. The United States National Herbarium is indicated by "N".

[3] Sp. Pl. 267. 1753.

ously *V. glabratum* H. B. K., a South American species described in 1818, but a photograph (procured by E. P. Killip) of the type in the Paris Herbarium shows that this species is not very closely related to any of those known from the area under consideration. The first Mexican species to be described was *Viburnum microcarpum* Schlecht. & Cham.[4] In 1840 and 1841 five species from this area were published by Bentham,[5] namely: *V. elatum*, *V. densum*, *V. acutifolium*, *V. discolor*, and *V. hartwegi*.

In 1861 Oersted [6] revised the genus *Viburnum*, dividing it into five genera: *Oreinotinus*, *Solenotinus*, *Microtinus*, *Viburnum*, and *Tinus*. All the tropical American species, with the exception of *V. elatum* and *V. densum*, were referred to the genus *Oreinotinus*, said by Oersted to be distinguished from *Viburnum* by its "spuriously trilocular ovary." The "spurious" cells are formed by a more or less prominent intrusion of the horny endocarp. This character is important as a sectional distinction, but it can hardly be regarded as of generic value. The 11 new species of *Oreinotinus* described from Mexico and Central America by Oersted were transferred to *Viburnum* by Hemsley,[7] who listed some 20 species in all. In recent years additional species have been proposed by Gandoger, Graebner, Bartlett, and Greenman.

CLASSIFICATION OF THE SPECIES

The first important classification of the species of *Viburnum* was that made by Oersted. His various segregate genera all probably constitute good sections or subgenera. *Oreinotinus*, with which we are chiefly concerned, was subdivided as follows:

Sect. 1. Tiliaefolii.—Folia ovata v. cordata, calloso-dentata, plerumque stellato-tomentosa. Costulae subtus prominentes, rectae, parallelae marginem attingentes, indivisae v. deorsum tantum ramos paucos emittentes; ramulae tenuissimae, parallelae costulas jungentes. [*Oreinotinus microcarpus*, *O. tiliaefolius*, *O. rhombifolius*, *O. stellato-tomentosus*, *O. wendlandi*, *O. membranaceus*, and *O. stenocalyx*.]

Sect. 2. Sloaneaefolii.—Folia oblonga v. ovata, plerumque integra v. levius dentata, saepe glabra. Costulae subtus prominentes, curvatae, intra marginem anastomosantes; ramulae parallelae v. subparallelae costulas jungentes.

a. Foliis tomento v. pube stellata tectis. [*O. ferrugineus*.]

b. Foliis supra glabris v. fere glabris subtus tomentosis v. dense pubescentibus. [*O. discolor* and *O. sulcatus*.]

c. Foliis glabris v. parce pubescentibus saepe ternatim verticillatis. [*O. hartwegi*, *O. fuscus*, *O. costaricanus*, *O. stellatus*, *O. acutifolius*, and *O. microphyllus*.]

This classification has much to commend it, but unfortunately it is not strictly accurate. Whether the principal lateral veins reach the

[4] Linnaea **5**: 170. 1830.

[5] Pl. Hartw. 59, 83, 84. 1840–41.

[6] Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 267–303. 1861.

[7] Biol. Centr. Amer. Bot. **2**: 2–3. 1881.

margin is apparently determined solely by the extent of the toothing of the leaves, which varies greatly in several species. The same specimen or even the same leaf may have both veins anastomosing and veins reaching the margin.

Study of the large series of specimens brought together has shown that these same sections may be quickly and accurately distinguished by the presence or absence of pubescence on the style. This unexpected correlation has not previously been pointed out; in fact, so far as the writer has been able to ascertain, the pubescence of the style has not even been mentioned in any of the specific descriptions. When present, it is conspicuous, even in the fruiting condition. All the species of Oersted's section Tiliaefolii have pubescent styles with the exception of *V. stellato-tomentosum* (including *V. wendlandi*), which the writer considers to be more closely related to *V. discolor* Benth.

The type and distribution of pubescence afford good specific characters, as do to a lesser degree the size and form of the leaves.

GEOGRAPHIC DISTRIBUTION

Most of the Middle American species of *Viburnum* are of limited distribution. None range outside of the area under consideration, with the exception of *V. pubescens* (Ait.) Pursh, a common species of the Eastern United States, which has been collected twice in Central Mexico. It is conceivable that this species has been introduced there, but further information will be necessary in order to reach a definite conclusion.

In Mexico seven species are confined to the central xerophytic plateau or its borders, namely: *V. australe, V. stenocalyx, V. dispar, V. loeseneri, V. elatum, V. ciliatum,* and *V. caudatum.* Of these, two show marked affinity to United States species, *V. elatum* being a Mexican analogue of *V. prunifolium* and *V. australe* a close relative of *V. affine.* The neotropical Mexican species are much rarer in herbaria, perhaps because of the few collections made in Oaxaca, Veracruz, and Chiapas. They are 13 in number, namely: *V. guatemalense, V. lautum, V. blandum, V. fuscum, V. microphyllum, V. acutifolium, V. jucundum, V. sulcatum, V. membranaceum, V. hirsutum, V. microcarpum, V. tiliaefolium,* and *V. rhombifolium.* These species are all endemic to Oaxaca, Veracruz, and Chiapas, except *V. guatemalense,* which occurs also in Guatemala and El Salvador.

In Guatemala are found five species: *V. guatemalense, V. hartwegi, V. disjunctum, V. discolor,* and *V. optatum.* No species are known from Honduras or Nicaragua, but the genus reappears again in Costa Rica and adjacent Panama, being represented by four endemic species: *V. stellato-tomentosum, V. costaricanum, V. conspectum,* and *V. venustum.*

From this enumeration it may be seen that the localization of the various species is pronounced. Less is known concerning the altitudinal distribution. All are, however, plants of altitudes of 1,000 meters or more. The highest elevation recorded is 3,300 meters, on Mount Zempoaltepec in Oaxaca.

SYSTEMATIC TREATMENT

VIBURNUM L.

Erect trees or shrubs; leaves opposite or rarely ternate, petiolate, usually evergreen, the blades pinnately or rarely palmately veined, entire, serrate or dentate (the teeth often glandular), glabrate or variously pubescent; stipules usually none, if present borne on the petiole; flowers small, hermaphrodite, borne in compound bracteate cymes; calyx tube frequently glandular or pubescent; calyx lobes 5, usually free to base, often ciliate, usually persistent on the fruit; corolla campanulate or rotate, the lobes 5, imbricate in bud, glandular-margined; stamens 5, inserted at base of the corolla tube, the filaments narrow, attenuate at apex, the anthers versatile, longitudinally dehiscent; ovary inferior, adnate to the calyx tube, 1-celled, the ovule solitary, anatropous, pendulous from the apex; style very short and thick, glabrous or pubescent, the stigmas 3, capitate, free or connate; drupe red or black, often sulcate, the horny endocarp often inflexed and forming a prominent central intrusion.

KEY TO THE SECTIONS AND SPECIES

Fruit distinctly flattened, without a central intrusion of the endocarp. Style glabrous.
- Leaves stipulate, conspicuously dentate; fruit slightly sulcate both dorsally and ventrally; cyme peduncled ..... I. STIPULATA.
- Leaves not stipulate, entire or slightly serrate; fruit not sulcate on either face; cyme sessile ..... II. SESSILIA.

Fruit not much flattened, invariably with a central intrusion of the endocarp. Style glabrous.
- Bracts at base of inflorescence leaflike. Hairs solitary or fasciculate, antrorse ..... III. BRACTEATA.
- Bracts at base of inflorescence not leaflike.
  - Leaves glabrous on the mesophyll beneath.
    - Cymes large, several times compound ..... IV. COSTARICANA.
    - Cymes small, twice compound (thrice compound in *V. microphyllum*). V. MEXICANA.
  - Leaves densely stellate-pubescent on the mesophyll beneath. VI. DISJUNCTA.

Style pubescent.
- Mature leaves glabrous on the mesophyll beneath (sometimes bearded in the vein axils).
  - Leaves ciliate.
    - Leaves entire or rarely with one or two serrations near apex, glabrous on the mesophyll above; rays of the cyme eglandular ... VII. OPTATA.
    - Leaves conspicuously dentate, strigose on the mesophyll above; rays of the cyme glandular ..... VIII. CILIATA.
  - Leaves not ciliate ..... IX. CAUDATA.
- Mature leaves stellate-pubescent on the mesophyll beneath .. X. SERRATA.

I. Stipulata

A single species (Nuevo Leon, Coahuila)..... **1. V. australe.**

II. Sessilia

Leaves acute, entire or minutely serrulate (central and southern Mexico).
2. V. elatum.

Leaves obtuse, serrate at apex (Nuevo Leon, Tamaulipas).
2a. V. elatum var. cuneifolium.

III. Bracteata

Corolla and calyx tube pubescent (Guatemala)..... **3. V. hartwegi.**
Corolla and calyx tube glabrous (Chiapas, Guatemala, and El Salvador).
4. V. guatemalense.

IV. Costaricana

Leaves opposite or in 3's, cuneate at base, entire; calyx lobes ciliate, sometimes sparingly so (Costa Rica and Panama)..... **5. V. costaricanum.**
Leaves all opposite, rounded or subcordate at base, entire or toothed; calyx lobes not ciliate.
Leaves obovate, rounded and conspicuously toothed at apex, mucronate; twigs gray, stellate-pilose (Panama)..... **6. V. conspectum.**
Leaves ovate, acute, entire or rarely with one or two teeth near apex; twigs reddish, glabrous (Costa Rica)..... **7. V. venustum.**

V. Mexicana

Stems hirsute. Calyx lobes ciliate; calyx tube eglandular; leaves ciliate (Chiapas)..... **8. V. lautum.**
Stems not hirsute.
Calyx lobes not ciliate; whole plant glabrous, except for a few long, simple hairs in the inflorescence; calyx tube eglandular (Chiapas).. **9. V. blandum.**
Calyx lobes ciliate; pubescence variously evident; calyx tube glandular.
Leaves fuscous beneath, the midrib bearing a few scattered, long, simple hairs, the vein axils bearded; branchlets and peduncle glabrous (Oaxaca)..... **10. V. fuscum.**
Leaves pale beneath, not fuscous, the midrib (when pubescent) with some stellate hairs; branchlets and peduncles with stellate pubescence (sometimes very sparse in age).
Leaves ciliate, the midrib pubescent beneath; branchlets and petioles conspicuously stellate-pubescent.
Calyx lobes stellate-pubescent and ciliate; bractlets at base of flowers stellate-pubescent and ciliate, much shorter than the calyx tube (Oaxaca)..... **11. V. microphyllum.**
Calyx lobes merely ciliate; bractlets at base of flowers merely ciliate, longer than the calyx tube (Jalisco)..... **12. V. dispar.**
Leaves not ciliate (exceptionally with a few cilia), glabrous throughout; branchlets and petioles practically glabrous (Oaxaca).
13. V. acutifolium.

VI. Disjuncta

Ovary densely stellate-pubescent; corolla pubescent; hairs on under surface of leaves sessile or in one species short-stipitate.

Leaves softly stellate-tomentose beneath (the hairs short-stipitate), stellate-pilose above (the hairs with erect branches about 1 mm long or more); calyx lobes and bractlets very densely stellate-tomentose (Chiapas).
14. V. jucundum.

Leaves stellate-puberulent beneath (the hairs sessile or rarely a few short-stipitate), sparsely stellate-pubescent above (the hairs with spreading branches less than 0.5 mm long); calyx lobes and bractlets sparingly pubescent.

Corolla bearing a few simple hairs; hairs of lower leaf surface moderately large (Guatemala)---------- **15. V. disjunctum.**

Corolla conspicuously stellate-pubescent; hairs of lower leaf surface minute (Guatemala)---------- **16. V. discolor.**

Ovary very sparingly pubescent, red-glandular; corolla glabrous; hairs on under surface of leaves long-stipitate (Costa Rica).
17. V. stellato-tomentosum.

Insufficiently known species, probably of this section (Oaxaca).
18. V. sulcatum.

VII. Optata

Veins of the leaves hirsute beneath; leaves conspicuously ciliate to base (Guatemala)---------- **19. V. optatum.**

Veins of the leaves glabrous beneath; leaves inconspicuously ciliate toward apex (Guatemala)---------- **19a. V. optatum** var. **vagum.**

VIII. Ciliata

Calyx lobes evidently ciliate; branchlets and petioles densely stellate-tomentose; rays of the cyme tomentose (Oaxaca)---------- **20. V. membranaceum.**

Calyx lobes not ciliate; branchlets and petioles hirsutulous, the hairs simple; rays of the cyme glabrate (Hidalgo)---------- **21. V. ciliatum.**

IX. Caudata

A single species (Hidalgo, Veracruz)---------- **22. V. caudatum.**

X. Serrata

Leaves small (5 cm long or usually less), subentire or shallowly dentate; calyx lobes densely stellate-pubescent when young; corolla sparsely stellate-pubescent; cyme not over 3 cm wide (Mexico)---------- **23. V. loeseneri.**

Leaves large (very much more than 5 cm long, except sometimes in *V. stenocalyx*), conspicuously serrate, dentate, or sinuate-dentate; calyx lobes glabrous on the back (except in *V. hirsutum* and *V. tiliaefolium*); corolla glabrous (except sometimes in *V. stenocalyx*); cymes at least 5 cm wide, usually more.

Petioles, branchlets, peduncles, rays of the cyme, and calyx tube all densely hirsute; leaves strigose above (Oaxaca)---------- **24. V. hirsutum.**

Petioles, branchlets, peduncles, rays of the cyme, and calyx tube stellate-tomentose; leaves stellate-pubescent (except sometimes in *V. stenocalyx*) or glabrous above.

Intrusion of the fruit very prominent, long-stalked, the seed conspicuously curved; leaves substrigose above, the hairs mostly simple, or furcate at base, rarely with 3 to 5 antrorse branches; hairs beneath comparatively few, sessile, few-branched (central Mexico).
25. V. stenocalyx.

Intrusion of the fruit obviously flattened and scarcely stalked, the seed lightly curved; leaves glabrous above or stellate-pubescent (the branches erect, not antrorse), stellate-tomentose beneath, the hairs many-branched.

Leaves glabrous above, rhombic or obovate, sharply serrate (especially toward the apex), cano-tomentose beneath (Veracruz, Puebla). **26. V. microcarpum.**

Leaves stellate-pubescent above, sinuate-dentate or sinuate-denticulate, more loosely tomentose beneath.

Leaves ovate or suborbicular, irregularly sinuate or sinuate-denticulate, subcordate or cordate at base; rays of the cyme densely tomentose; calyx tube glandular, often conspicuously so; calyx lobes usually pubescent on the back (Veracruz) **27. V. tiliaefolium.**

Leaves rhombic, regularly sinuate-dentate, rounded but not at all cordate at base; rays of the cyme thinly tomentose; calyx tube eglandular or practically so; calyx lobes glabrous on the back (Veracruz) **28. V. rhombifolium.**

Species excluded from foregoing groups (central Mexico). **29. V. pubescens.** **30. V. stellatum.**

1. Viburnum australe Morton, sp. nov.

Sect. *Stipulata.* Ramuli angulati, sparse glandulosi, demum omnino glabri; petioli glandulosi, hispiduli, stipulas persistentes lineares glandulosas hispidulas gerentes; laminae foliorum late ovatae vel suborbiculares, apice breviter acuminatae, basi cordatae vel subcordatae, evidenter dentatae, ciliatae, supra juventute sparse strigosae demum glabratae, subtus glandulosae, venis hirsutulis, axillis barbatis; pedunculi glandulosi, pilos stellatos multiradiatos paucos gerentes; bracteae conspicuae, basi angustatae, glanduolsae, sparse pubescentes, pilis simplicibus et stellatis; cymae radii dense glandulosi; bracteolae lineares, glandulosae, ciliatae; calycis tubus cylindricus, dense glandulosus; calycis lobi acuti, eglandulosi, extus glabri, ciliati; corolla glabra; stylus glaber; fructus compressus, carnosus, dorso 3-sulcatus, ventre 2-sulcatus, endocarpio haud inflexo.

Branches angled, dull, glabrous, pale; branchlets similar, sparsely glandular; leaves opposite, petiolate, the petiole up to 1 cm long, glandular, hispidulous, stipulate, the stipules persistent, borne on the petiole about 1.5 to 2 mm above its base, linear, up to 5 mm long, glandular and hispidulous; blades broadly ovate to suborbicular, the larger 6 cm long by 4.5 cm wide, cordate or subcordate at base, abruptly short-acuminate at apex, conspicuously dentate (the teeth broad, extending to the middle of the blade or below), ciliate, above sparsely but uniformly strigose (the hairs all simple), glabrate with age, beneath glandular, hispidulous on the veins and veinlets, densely bearded in the vein axils; lateral veins 2 to 5, straight, reaching the margin; peduncle up to 3.5 cm long, conspicuously glandular, bearing a few stellate hairs, these with numerous spreading branches; bracts at base of inflorescence conspicuous, up to 1.5 cm long, 2 mm broad at middle, narrowed at base, glandular and sparsely pubescent, the hairs both simple and stellate; cyme up to 5.7 cm wide and 3 cm long, twice compound, the primary rays 6 to 8, very densely glandular; bractlets of cyme linear, glandular, sparingly ciliate; calyx tube 2 to 2.5 mm long, cylindric, densely glandular; calyx lobes about 1 mm long, acute, ciliate with long simple hairs, glabrous on the back, eglandular; corolla 3.5 to 4 mm long, glabrous; stamens slightly exserted, the filaments about 4 mm long; style glabrous; fruit much flattened, about 1 cm long, 8 mm wide, and 3 mm thick, fleshy, the endocarp 3-sulcate on one face (the central groove very slight, the lateral pronounced) and lightly 2-sulcate on the other, with no ventral intrusion.

Type in the U.S. National Herbarium, no. 462237, collected in the Sierra Madre above Monterrey, Nuevo León, Mexico, alt. about 900 meters, April 25, 1906, by C. G. Pringle (no. 10193). Duplicates in all the herbaria consulted.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: General Cepida, Coahuila, Apr. 20, 1902, *Nelson* 6725 (G, N). Caracol Mountain, 21 miles southeast of Monclova, Coahuila, February–October 1880, *E. Palmer* 388 (G, K, N).

This is a truly remarkable new species, which has previously been identified as *Viburnum membranaceum* (Oerst.) Hemsl. Examination of the type specimen of the latter species shows, however, that it is utterly different and can not even be referred to the same section. *V. australe* is, in fact, by the structure of the fruit, by the stipules, and by general habit closely related to a United States species, *V. affine* Bush (excluding the var. *hypomalacum*, which is to be considered a distinct species). It differs, however, from *V. affine* as follows:

Lobes of the calyx distinct almost to base, about 1 mm long; primary leaf veins, as also the minute intermediate veinlets, hirsutulous beneath; glands of the calyx tube large, conspicuously stipitate ..... **V. australe.**

Lobes of the calyx united for half their length into a rotate disk, about 0.5 mm long; principal leaf veins hirsutulous beneath, the veinlets glabrous; glands of the calyx tube very minute, scarcely if at all stipitate ..... **V. affine.**

2. Viburnum elatum Benth. Pl. Hartw. 59. 1840.

Viburnum densum Benth. Pl. Hartw. 59. 1840.

Branches stout, pale brown, terete, smooth, not shining, glabrous; branchlets similar, very slender, slightly angular, black-punctate; buds glabrous; leaves opposite, petiolate, the petiole 1 cm long or less, deeply channelled above, winged to base, glabrous, black-punctate; blades ovate to lanceolate, small (the larger 6 cm long, 3 cm wide), acute or bluntly acuminate at apex, cuneate at base, entire or minutely serrulate, almost concolorous, glabrous, conspicuously black-punctate beneath; principal veins 5 to 7, inconspicuous, scarcely if at all elevated beneath, arcuate and anastomosing; peduncle none; cyme thrice compound, up to 3 cm long and 6.5 cm wide, the primary rays 4 or 5, about 1.5 cm long, glabrous, black-punctate; bractlets of inflorescence minute, 1 mm long or less, glabrous, those subtending the flowers about one-fourth as long as the calyx tube; calyx tube cylindric, about 2 mm long, glabrous; calyx lobes rounded, minute (about 0.5 mm long), glabrous; corolla white, rotate-campanulate, about 3 mm long, glabrous; style glabrous; fruit much flattened, black, about 10 mm long, 8 mm wide, and 3 mm thick, fleshy, not sulcate on either face, the intrusion absent.

Type in the Kew Herbarium, collected at Tlalpuxahua, Mexico, May 1830, by Graham. Duplicate in the Gray Herbarium.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Real del Monte, May 1830, *Graham* (K; type of *V. densum*); Mar. 22, 1849, *Gregg* 619 (G, M). Chiapas, *Linden* 567 (K). Tlopisca, Chiapas, May 14, 1904, *Goldman* 973 (N); May 7, 1904, *Goldman* 936 (N). Zimapan, Hidalgo, *Coulter* 216 (G), 903 (G). Vicinity of Morelia, Michoacán, alt. 1,950 meters, April 1911, *Arsène* 5256 (G, M, N). Sierra Madre, Michoacán or Guerrero, alt. 1,600 meters, May 2, 1899, *Langlassé* 1017 (N). Alvarez, San Luis Potosí, Sept. 5–10, 1902, *Palmer* 120 (G, M, N, Y); July 13–23, 1904, *Palmer* 196 (F, K, M, N, Y). Near Toluca, Mexico, April 1834, *Andrieux* 339 (K), 340 (K). Thickets near Eslaba, Federal District, alt. 2,400 meters, Nov. 17, 1903, *Pringle* 11466 (Co, F, G, N); alt. 2,240 meters, May 27, 1904, *Pringle* 13012 (Co, F, G, N); alt. 2,240 meters, Apr. 13, 1904, *Pringle* 13011 (Co, F, G, N). By streams, base of Sierra de Ajusco, Federal District, alt. 2,250 meters,

Aug. 16, 1897, *Pringle* 6666 (C, F, M, N, Y); Nov. 2, 1896, *Pringle* 6226 (C, F, G, M, N, Y). Valley of Mexico, Oct. 10, 1896, *Pringle* (N). Ahuasco, March 1848, *Halstead* (G). Without specific locality, *Uhde* 710 (C, N); *Ehrenberg* 578 (C, N); *Coulter* 630 (G).

This, the most widespread species in Mexico, is somewhat variable and may be divisible into recognizable varieties. The types of *V. densum* and *V. elatum* are almost identical. *V. elatum* is most closely related to the United States species, *V. prunifolium* L.

2a. Viburnum elatum Benth. var. **cuneifolium** (Bartlett) Morton.

Viburnum cuneifolium Bartlett, Proc. Amer. Acad. **44**: 635. 1909.

Differs from the typical form of the species only in its smaller, obtuse leaves, serrate at apex.

Type in the Gray Herbarium, collected in the Sierra Madre above Monterrey, Nuevo León, Mexico, alt. 750 meters, Mar. 27, 1906, by C. G. Pringle (no. 10234). Duplicates are in all the herbaria consulted.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Santa Rita Ranch, South Victoria, Tamaulipas, alt. 1,500 meters, Apr. 7, 1926, *Runyon* 986 (N), 1048 (N).

This variety is the most northerly representative of the genus in Mexico.

3. Viburnum hartwegi Benth. Pl. Hartw. 84. 1841.

Branchlets stout, about 3.5 mm thick, angled, densely pubescent when young with antrorse, fasciculate, yellowish hairs; bud scales densely pubescent; leaves opposite, petiolate, the petiole up to 15 mm long, canaliculate, pubescent like the branchlets; blades elliptic or elliptic-lanceolate, the larger about 9.5 cm long and 4.5 cm wide, cuneate and somewhat oblique at base, obtusely acuminate at apex, entire, shining, almost glabrous above (the hairs very few, minute, solitary or fasciculate), paler beneath and not shining, the pubescence similar to that of the upper surface, more dense on the veins, the vein axils conspicuously barbate; primary veins about 4, arcuate-ascending, anastomosing before reaching the margin, slightly elevated on both surfaces; peduncle about 2 cm long, stout, about 2 mm thick, densely pubescent like the branchlets; bracts at base of inflorescence deciduous; cyme very large, up to 11 cm wide and 6.5 cm long, 3 to 4 times compound, the primary rays about 8, up to 3 cm long, the secondary shorter, all densely yellowish pubescent like the branchlets; terminal flowers sessile, the lateral short-pedicellate; calyx tube subcylindric, not red-glandular, minutely strigose, the hairs antrorse, solitary or fasciculate; calyx lobes low, about 0.75 mm long, rounded, strigose, long-ciliate; corolla campanulate, about 3 mm long, strigose; anthers scarcely exserted, orbicular, about 0.75 mm long; style glabrous.

Type in the Kew Herbarium, collected in the Santa María Mountains near Guatemala City, Guatemala, 1840, by Hartweg (no. 580). Duplicate at the New York Botanical Garden.

ADDITIONAL SPECIMENS EXAMINED:

GUATEMALA: Santiago, Dept. Zacatepequez, alt. about 1,950 meters, in 1891, *Gomez* (J. D. Smith, no. 859; G, K, N).

4. Viburnum guatemalense Gandog. Bull. Soc. Bot. France **65**: 33. 1918.

Shrub or tree, 2 to 7.5 meters high; branches terete, glabrous; branchlets slightly angled, strigose, the hairs fasciculate, usually in pairs; leaves opposite, petiolate, the petiole up to 12 mm long, sparsely pubescent like the branchlets; blades elliptic or lanceolate-elliptic, the larger about 13.5 cm long by 5.3 cm wide, sharply or obtusely acuminate at apex, cuneate and complicate at base, entire, glabrate

above at maturity (the hairs very few and inconspicuous, fasciculate, antrorse), beneath paler, pubescent like the upper surface, and more or less densely bearded in the vein axils; primary veins about 5, arcuate-ascending, anastomosing toward the margin; peduncle long (up to 12 cm), very stout, pubescent like the branchlets, glabrescent; bracts at base of inflorescence leaflike, up to 5 cm long, numerous, petiolate, pubescent like the leaves; cyme very large, up to 13 cm wide and 8.5 cm long, 4 to 5 times compound, the primary rays 7 to 9, up to 6 cm long, the secondary shorter, all pubescent like the branchlets; terminal flowers sessile, the lateral pedicellate; bractlets at base of flowers linear, ciliate, longer than the calyx tube; calyx tube cylindric-obconic, 1.5 mm long or less, glabrous or sparsely glandular; calyx lobes deltoid, about 0.75 mm long, rounded at apex, glabrous on the back, ciliate; corolla white, campanulate, about 3 mm long, glabrous; stamens slightly exserted; style glabrous; fruit black, ellipsoidal, scarcely flattened, about 8 mm long, 6 mm wide, 4 mm thick, scarcely fleshy, glabrous, deeply sulcate on the ventral face, the intrusion prominent, bilobed.

The very brief original description is based upon material collected in Alta Verapaz by von Tuerckheim. The collector's number is not cited.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Chiapas, 1864–70, *Ghiesbreght* 809 (G, K). Finca Covadonga, Chiapas, June 1913, *Purpus* 7833 (C, G, M, N).

GUATEMALA: San Lucas, alt. 1,500 meters, Jan. 23, 1907, *Kellerman* 6628 (F). Near Antigua, Dept. Sacatepequez, alt. 1,800 meters, Feb. 3, 1908, *Kellerman* 7575 (F). Volcán de Agua, Dept. Sacatepequez, alt. 2,850 meters, Feb. 5, 1908, *Kellerman* 7453 (F, Y). Near Chimaltenango, alt. about 1,800 meters, Feb. 4, 1931, *Bequaert* 2 (F). Near San Rafael, near Guatemala City, alt. 1,465 meters, Feb. 3, 1907, *Kellerman* 6452 (F). Laguna de Ayarza, Dept. Jalapa, alt. about 2,400 meters, September 1892, *Heyde & Lux* (J. D. Smith, no. 3972; G, N). Near San Lucas, Dept. Antigua, Oct. 30, 1896, *Seler* 2413 (G, K, N, Y). Cobán, Dept. Alta Verapaz, alt. 1,300 meters, August 1885, *von Tuerckheim* 41 (F, G, K, N); January 1903, *von Tuerckheim* 8489 (F, G, N); April 1889, *J. D. Smith* 1730 (N, Y); September 1907, *von Tuerckheim* II, 679 (Co, F, G, M, N, Y); Nov. 9, 1919, *Johnson* 37 (N). Santa Rosa, Dept. Santa Rosa, alt. 900 meters, August 1892, *Heyde & Lux* (J. D. Smith, no. 3971; G, N). Without specific locality, *Heyde* 230 (N), 437 (N); *Salas* 654 (N).

EL SALVADOR: San Juan de Diós, alt. 1,470 meters, Feb. 27, 1907, *Pittier* 1992 (N). Comasagua, December 1922, *Calderón* 1368 (N, Y). Volcán de San Vicente, Dept. San Vicente, alt. 1,200 to 1,500 meters, Mar. 7–8, 1922, *Standley* 21591 (G, N, Y). Volcán de San Salvador, alt. 1,000–1,800 meters, Apr. 7, 1922, *Standley* 22869 (G, M, N, Y); *Calderón* 460 (N).

5. Viburnum costaricanum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 2. 1881.

Oreinotinus costaricanus Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 290. 1861.

Tree up to 9 meters high; branches more or less angled, about 3 mm thick, glabrous; branchlets angled or subterete, at first stellate-pubescent (the hairs sessile, with several short branches), glabrescent; leaves opposite or in 3's, petiolate, the petiole sulcate, up to 1.3 cm long, pubescent like the branchlets, at length glabrate; blades elliptic, or oblanceolate to obovate, the larger 12 cm long by 4.5 cm wide, cuneate at base, abruptly short-acuminate or merely acute at apex, entire, pale beneath, when young sparsely pubescent above with few-branched, sessile, stellate hairs, at length glabrous except along the midribs.

beneath sparsely stellate-pubescent at first, the hairs chiefly confined to the midvein and primary veins, glabrate at maturity; peduncle up to 6 cm long, glabrate; bracts at base of inflorescence not seen; cyme 3 to 5 times compound, up to 16 cm wide and 8 cm long, the primary rays 5 to 8, up to 3 cm long, sparsely stellate-pubescent, slightly or not at all glandular; bractlets of inflorescence ciliate, those subtending the flowers equal to or shorter than the calyx tube; calyx tube short, 1 mm long or less, glabrous, sparingly red-glandular; calyx lobes broadly deltoid, about 0.5 mm long, glabrous, ciliate; corolla creamy white, rotate-campanulate, 2 to 3 mm long, glabrous, the lobes broadly rounded; stamens obviously exserted, the filaments 3 to 4 mm long, the anthers elliptic, 1 mm long; style glabrous, conspicuous; fruit green or black, ellipsoidal, 4 to 8 mm long, 3 to 6 mm wide, 2 to 5 mm thick, scarcely fleshy, shallowly sulcate ventrally, the intrusion very narrow and flat.

Type in the Copenhagen Herbarium, collected on Volcán Irazú, Costa Rica, alt. about 2,700 meters, January 1847, by Oersted (no. 7808).

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Hills of Santiago, near San Ramón, alt. 1,300 meters, May 3, 1901, *Brenes* (Herb. Nat. Cost. 14316; K, N). Forests of Achiote, Volcán Poás, alt. 2,200 meters, November 1896, *Tonduz* (Herb. Nat. Cost. 10806; N). Banks of Río Segunda, January 1890, *Tonduz* (Herb. Nat. Cost. 1716; N). Volcán Irazú, alt. 2,700 meters, June 24, 1874, *Kuntze* 2275 (K, Y). Alto de la Estrella, Prov. Cartago, Mar. 26–27, 1924, *Standley* 39277 (N). Zurquí, Prov. San José, alt. 2,000–2,500 meters, Feb. 13, 1926, *Standley & Valerio* 48126 (N). Vicinity of Fraijanes, Prov. Alajuela, alt. 1,500–1,700 meters, Feb. 12–13, 1926, *Standley & Torres* 47659 (N). San Cristóbal Road, alt. 2,400 meters, May 27, 1928, *Stork* 2223 (F). Cerro de las Vueltas, alt. 2,700–3,000 meters, Dec. 29, 1925–Jan. 1, 1926, *Standley & Valerio* 43515 (N). Santa María de Dota, Prov. San José, alt. 1,500–1,800 meters, *Standley* 42519 (F, N); *Standley & Valerio* 43466 (N). Near Finca La Cima, above Los Lotes, north of El Copey, Prov. San José, alt. 2,100–2,400 meters, Dec. 21–22, 1925, *Standley* 42583 (N). Oak forest near Quebradillas, about 7 km north of Santa María de Dota, Prov. San José, alt. 1,800 meters, Dec. 24, 1925, *Standley* 43045 (N). Cervantes, near Cartago, alt. 1,300 meters, December 1896, *Tonduz* (Herb. Nat. Cost. 10422; N). Cañas Gordas, alt. 1,100 meters, February 1897, *Pittier* (Herb. Nat. Cost. 11188; Co, N). Estrella, May 30, 1928, *Stork* 2832 (F). Two miles southwest of Agua Caliente, Apr. 1, 1928, *Stork* 1318 (F). El Copey, alt. 1,800 meters. March 1898, *Tonduz* 7354 (Herb. Nat. Cost. 11923; F, G, N, Y).

PANAMA: Vicinity of El Boquete, Chiriquí, alt. 1,000–1,300 meters, Mar. 16, 1911, *Maxon* 5379 (F, N).

The present species is undoubtedly an aggregate. The Kuntze specimen cited (from the type locality) is a good match for the type in the Copenhagen Herbarium. Many of the other specimens show marked variations. Although some of these are undoubtedly of taxonomic importance, I have been unable to provide a satisfactory classification.

6. Viburnum conspectum Morton, sp. nov.

Sect. *Costaricana*. Ramuli juventute stellato-pilosi, pilis sessilibus pauciradiatis, demum glabrati; petioli stellato-pubescentes; laminae foliorum suborbiculares vel late obovatae, apice rotundatae, mucronatae, serratae, basi rotundatae vel subcordatae, integrae, supra juventute parce stellato-pubescentes, demum glabrae, subtus venis substrigosae, alioqui glabrae; bracteae parvae, lineares, acuminatae, utrinque glabrae, ciliatae; cymae radii stellato-puberulenti, sparse

nigroglandulosi; calycis tubus cylindrico-obconicus, parce strigosus; calycis lobi deltoidei, fere glabri, eciliati; corolla rotato-campanulata, glabra; stylus glaber.

Shrub 0.4 to 1 meter high; branches thick, about 8 mm in diameter, glabrous, shining, with large lenticels; branchlets similar, about 2.5 mm in diameter, stellate-pilose when young, the hairs sessile, with few long, spreading branches; buds densely pubescent; leaves opposite, petiolate, the petiole short, about 5 mm long, deeply channelled above, conspicuously stellate-pubescent; blades suborbicular or broadly obovate, the larger 7.5 cm long and 5 cm wide, rounded and short-mucronate at apex, rounded or subcordate at base, serrate at apex (the teeth glandular), entire below the apex, deep green above, pale beneath, glabrous above at maturity, sparingly stellate-pubescent when young (the hairs sessile, few-branched), beneath conspicuouly substrigose on the veins, otherwise glabrous; principal lateral veins about 3, reaching the margin; peduncle short, up to 3 cm long, 1.5 mm thick, pubescent like the branchlets; bracts at base of inflorescence small, linear, up to 8 mm long and 1 mm wide at base, acuminate at apex, glabrous on the surfaces, ciliate; cyme twice compound, up to 3.5 cm high and 7 cm broad, the primary rays about 7, up to 2.5 cm long, the secondary very short, all stellate-puberulent, sparingly black-glandular; bractlets of inflorescence numerous, linear, persistent; calyx tube cylindric-obconic, about 1.5 mm long, sparsely strigose; calyx lobes deltoid, about 1 mm long, concave, almost glabrous, near the base beset with a few, straight, simple hairs, not ciliate; corolla about 3 mm long, rotate-campanulate, glabrous; stamens not exserted; style glabrous.

Type in the U.S. National Herbarium, no. 677659, collected between the Río Ladrillo and Los Siguas Camp, southern slopes of Cerro de la Horqueta, Chiriquí, Panama, alt. 1,200 to 1,700 meters, Mar. 17–19, 1911, by H. Pittier (no. 3268). Duplicates at the Field Museum.

This striking species is known only from the original collection.

7. Viburnum venustum Morton, sp. nov.

Sect. *Costaricana*. Ramuli teretes, nitentes, rubescentes, glabri; petioli glabri vel pilis paucis simplicibus instructi; laminae foliorum ovatae, apice longe acuminatae, basi rotundatae vel truncatae, integrae vel raro sursum dentibus paucis acutis glandulosis instructae, supra nitentes nervo medio stellato-pubescentes, alioqui glabrae, subtus glabrae (venarum axillis exceptis), eciliatae; pedunculi glabrati; bracteae lineari-lanceolatae, glanduloso-ciliatae; cymae radii pilosuli, rubroglandulosi; bracteolae extus substrigosae, eciliatae vel vix ciliatae; calycis tubus obconicus, glaber, saepe eglandulosus; calycis lobi deltoidei, glabri; corolla rotato-campanulata, glabra; stylus glaber; fructus ovoideus, niger, ventre sulcatus, endocarpio evidenter inflexo.

Branchlets terete, 3 to 3.5 mm thick, shining, reddish, glabrous; leaves opposite, petiolate, the petiole up to 2 cm long, scarcely channelled above, glabrous or with a few scattered simple hairs; blade ovate, the larger 12 cm long and 7 cm wide, sharply long-acuminate at apex, rounded or truncate at base, entire or rarely with a pair of sharp glandular teeth near the apex, very lustrous above, pale beneath, not ciliate, above sparsely stellate-pubescent on the depressed midvein, otherwise glabrous, beneath bearded in the vein axils, otherwise glabrous; lateral veins about 4, arcuate and anastomosing, prominent beneath, secondary veins conspicuous, reticulate; peduncle variable in length, glabrate, the hairs few, scattered; bracts at base of inflorescence linear-lanceolate, not leaflike, about 11 mm long, 1.5 mm wide at base, glandular-ciliate; cyme variable in size, 3 to 4 times compound, up to 6 cm high and 10 cm wide, the primary rays about 7, up to 3 cm long, the secondary rays much shorter, all conspicuously pilosulous, red-glandular; bractlets of inflorescence numerous, persistent, linear-lanceolate, substrigose on the back, not or very sparingly ciliate; calyx tube obconic, 1 to 1.5 mm long, glabrous, usually eglandular; calyx lobes deltoid, up to 1

mm long, acute, entirely glabrous; corolla white, rotate-campanulate, 2.5 to 3 mm long, glabrous; stamens not exserted, the filaments short, glabrous, the anthers elliptic, 1 mm long; style conspicuous, glabrous; fruit ovoid, black, flattened, about 6 mm long, 5 mm wide, 2.5 mm thick, slightly fleshy, deeply sulcate ventrally, the intrusion prominent, bilobed, the persistent calyx lobes erect, conspicuous.

Type in the U.S. National Herbarium, no. 1,306,420, collected on Cerros de Zurquí, northeast of San Isidro, Prov. Heredia, Costa Rica, alt. 2,000 to 2,400 meters, March 3, 1926, by Paul C. Standley and J. Valerio (no. 50545).

Additional specimens examined:

Costa Rica: Volcán de Poás, alt. 2,600 meters, Mar. 31, 1907, *Pittier* 2053 (N). Forests of Rancho Flores, alt. 2,043 meters, Feb. 22, 1890, *Tonduz* (Herb. Nat. Cost. 2108; F, N). Vicinity of La Palma, on the road to La Hondura, alt. 1,500–1,700 meters, July 17–18, 1923, *Maxon & Harvey* 7987 (N). Las Nubes, Prov. San José, alt. 1,500–1,900 meters, Mar. 20–22, 1924, *Standley* 38747 (N). Cerros de Zurquí, Prov. Heredia, alt. 2,000–2,400 meters, Mar. 3, 1926, *Standley & Valerio* 50479 (N).

All these specimens have been referred previously to *V. stellatum* (Oerst.) Hemsl., but examination of the type material of that species shows that *V. venustum* is not at all closely related, its alliance being with *V. costaricanum.*

8. Viburnum lautum Morton, sp. nov.

Sect. *Mexicana.* Ramuli graciles, hirsuti; petioli glabrati; laminae foliorum ovales vel ellipticae, apice acutae, basi cuneatae vel rotundatae, integrae vel dentibus glandulosis paucis basi instructae, subtus juventute nervis mediis hirsutae, venis lateralibus hirsutulae, aetate glabrescentes; pedunculi hirsuti; bracteae lineari-oblanceolatae, apice acutae, basi attenuatae, parce ciliatae; cymae radii hirsuti, eglandulosi; bracteolae lineares, ciliatae; calycis tubus obconicus, glaber, eglandulosus; calycis lobi deltoidei, ciliati; corolla glabra; stylus glaber.

Small tree, 1.5 to 1.8 meters high; branchlets slender, about 1.5 mm thick, conspicuously but not densely hirsute, the hairs widely spreading, usually simple, rarely 2- or 3-branched at base; buds glabrate; leaves opposite, petiolate, the petiole slender, 5 to 8 mm long, deeply channelled and slightly 2-winged above, glabrate, bearing a few simple hairs; blades oval or elliptic, the largest 4.5 cm long by 2.5 cm wide, acute or rarely subacuminate at apex, rounded or cuneate at base, entire or sometimes with 1 or 2 pairs of inconspicuous glandular teeth near the base, conspicuously ciliate, green above, very pale beneath, glabrous on the leaf tissue of both surfaces, beneath hirsute along the midrib when young, hirsutulous along the principal lateral veins, glabrescent with age, the hairs all simple; principal lateral veins about 4, arcuate and anastomosing; peduncle 3 to 5 cm long, about 1.4 mm thick, pubescent like the branchlets; bracts at base of inflorescence deciduous, linear-oblanceolate, acute at apex, narrowed at base, about 1 cm long, 1.4 mm wide at widest place, sparingly ciliate, otherwise glabrous; cyme twice compound, about 2 cm high and 4 cm wide, the primary rays 6 or 7, up to 1.4 cm long, the secondary very short, all conspicuously pubescent like the branchlets, eglandular; bractlets of the inflorescence numerous, linear, subpersistent, ciliate, otherwise glabrous; calyx tube obconic, about 2 mm long, glabrous, eglandular, calyx lobes deltoid, about 1 mm long, obtusish, conspicuously ciliate, otherwise glabrous; corolla white, open-campanulate, about 3 mm long, glabrous, the lobes rounded; stamens slightly exserted; style glabrous.

Type in the Gray Herbarium, collected in Chiapas, Mexico, 1864–70, by A. Ghiesbreght (no. 517). Duplicates at Kew and the Missouri Botanical Garden.

Viburnum lautum is apparently not closely related to any of the other species of the section *Mexicana.* The pubescence is characteristic.

9. Viburnum blandum Morton, sp. nov.

Sect. *Mexicana*. Ramuli teretes, rubescentes, nitentes, glabri; petioli glabri, canaliculati; laminae foliorum ovales, apice longe acuminatae, basi cuneatae, integrae, glabrae; pedunculi graciles, glabri; cymae radii glabri; bracteolae lineares, glabrae; calycis tubus cylindrico-obconicus, glaber, eglandulosus; calycis lobi deltoidei, glabri, ciliati; corolla campanulato-rotata, glabra, lobis saepe reflexis; stylus glaber.

Branchlets terete or slightly angular, about 2 mm thick, reddish, shining, glabrous, the epidermis thin, hyaline, exfoliating; buds glabrous or with a few long hairs at the tip; leaves opposite, petiolate, the petiole 6 to 8 mm long, glabrous, channelled above; blades oval, the largest 8 cm long and 3 cm wide, sharply long-acuminate at apex, cuneate at base, dark green above, pale yellowish green beneath, entire except for a pair of marginal glands near the base, completely glabrous; principal veins about 6 pairs, the intermediate veins very numerous and obviously reticulate; peduncle 2.5 to 4 cm long, slender (about 0.8 mm wide), glabrous; bracts at base of inflorescence deciduous; cyme twice compound, up to 2.5 cm long and 4 cm wide, the primary rays up to 14 mm long, the secondary much shorter, all glabrous; terminal flowers sessile in clusters of 2 or 3, lateral flowers short-pedicellate, the pedicels up to 3 mm long, glabrous; bractlets subtending the flowers linear, slightly longer than the calyx tube, glabrous, deciduous; calyx tube cylindric-obconic, about 2 mm long, glabrous, eglandular; calyx lobes deltoid, about 0.7 mm long, glabrous, not ciliate; corolla campanulate-rotate, about 3.5 mm long, glabrous, the lobes rounded, about 1.5 mm long, more or less reflexed; filaments slightly exserted; style glabrous.

Type in the U.S. National Herbarium, no. 256530, collected at Pinabete, Chiapas, Mexico, alt. 2,200 to 2,700 meters, Feb. 8, 1896, by E. W. Nelson (no. 3782). A duplicate is in the Gray Herbarium.

This species is easily distinguished by its nonciliate calyx lobes and bracts and the almost complete absence of pubescence. Neither the calyx tube nor the rays of the cyme are glandular.

10. Viburnum fuscum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 2. 1881.

Oreinotinus fuscus Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 289. 1861.

Branches terete, about 3 mm thick, smooth, glabrous and shining, marked by conspicuous lenticels, brownish; branchlets slender, about 1.5 mm thick, shining, red, glabrous except for a few long simple antrorse hairs; bud scales pubescent at apex; leaves opposite, petiolate, the petiole canaliculate above, 5 to 7 mm long, when young pubescent like the branchlets, glabrous at maturity; leaf blades elliptic or elliptic-oblanceolate, the larger 10 to 10.5 cm long and 4.5 to 5 cm wide, cuneate at base, long-acuminate, entire, green above, pale and reddish beneath, glabrous except for a few scattered simple hairs on the veins beneath; primary veins 4 or 5, arcuate-ascending, anastomosing, not reaching the margin; peduncle long (4 to 6 cm), glabrous, reddish; bracts at base of inflorescence oblong or oblanceolate, acute, ciliate; cyme 3 to 5 cm wide, almost glabrous, twice compound, the primary rays 6 or 7, 1.2 to 1.7 cm long, the secondary much shorter; terminal flower sessile, lateral pedicellate, the pedicels slender, 1.5 to 2 mm long; bractlets present at the base of each flower, linear or linear-oblong, longer than the calyx tube, ciliate; calyx tube cylindric-obconic, 1.5 mm long or less, glabrous, sparingly red-glandular; calyx lobes deltoid, acute or rounded, about 0.5 mm long, glabrous, conspicuously ciliate; corolla rather fleshy, open-campanulate, about 5 mm wide, 2.5 mm long, glabrous, the lobes rounded, glandular-margined; style glabrous.

Types in the Copenhagen Herbarium, collected by Liebmann, in Oaxaca, Mexico, at Totontepec (no. 7809), at Tonaguia (no. 7810), and at San Jago Amatlan (no. 7811).

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Near Totontepec, Oaxaca, alt. 1,250–1,800 meters, July 15–28, 1894, *Nelson* 828 (N).

Viburnum fuscum Oerst. was reduced to the synonymy of *V. acutifolium* Benth. by Standley,[8] but incorrectly so. The only specimen of this species seen in American herbaria is the Nelson collection (from the type locality) cited above, which had been identified as *V. glabratum* H. B. K. Examination of the type specimens of both *V. fuscum* and *V. acutifolium* shows the two species to be very distinct, not only in the characters pointed out in the key but also in leaf shape and general habit.

11. Viburnum microphyllum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881.

Oreinotinus microphyllus Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 293. 1861.

Branches terete, about 2 mm thick, glabrous, rough and conspicuously fissured, lenticels numerous, black; branchlets slightly ribbed, pubescent, the hairs stellate, sessile (the branches few and short); bud scales pubescent with simple hairs; leaves opposite, petiolate, the petiole 5 to 8 mm long, sulcate, pubescent, the hairs stellate, few-branched; blades oblong to lanceolate, small, the larger 5.3 cm long and 2.3 cm wide, cuneate at base, sharply acuminate at apex, entire, scarcely paler beneath, glabrous above except for stellate hairs on the midvein, pubescent beneath on the midvein and near the base of the leaf with long, white, stellate hairs, densely bearded in the vein axils; primary veins 4 to 6, obscure above, slightly elevated beneath, arcuate-ascending, anastomosing, not reaching the margin; peduncle 1.5 to 2.2 cm long, pubescent like the branchlets; bracts at base of inflorescence deciduous; cyme about 6 cm broad in fruit, thrice compound, the rays pubescent like the branchlets; primary rays 4 to 6, stout (0.75 to 1 mm thick), very variable in length in the same inflorescence, 3.5 to 20 mm long, secondary rays variable in length; terminal flowers sessile, lateral pedicellate, the pedicels stout; bracts at base of flowers linear or linear-oblong, pubescent, ciliate, shorter than the calyx tube; calyx tube subcylindric, densely red-glandular, with a few white simple hairs intermixed; calyx lobes deltoid, rounded or acutish at apex, sparingly pubescent, ciliate; corolla campanulate, about 2.5 mm long, glabrous or with a few scattered simple hairs, the lobes rounded; anthers elliptic, about 1 mm long; style glabrous; stigmas 3, capitate; fruit immature.

Type in the Copenhagen Herbarium, collected at Cuesta de San Pedro Alto, Oaxaca, Mexico, alt. 2,600 meters, by Liebmann (no. 7816).

This species is known only from the original collection.

12. Viburnum dispar Morton, sp. nov.

Sect. *Mexicana*. Ramuli teretes, stellato-puberulenti, pilis minutis sessilibus multiradiatis, glabrescentes; petioli sparse stellato-pubescentes vel pilis simplicibus instructi; laminae foliorum ovatae vel ellipticae, apice acuminatae, basi late cuneatae, integrae, nervis mediis pubescentes (pilis stellatis et simplicibus intermixtis), ciliatae; pedunculi minute stellato-puberulenti; cymae radii dense stellato-puberulenti, sparse rubroglandulosi; calycis tubus cylindrico-obconicus, pilis simplicibus et stellatis sparse instructus; calycis lobi deltoidei, acuti, ciliati; corolla glabra; stylus glaber.

Shrub 5 to 6.5 meters high; branchlets terete, stellate-puberulent (the hairs sessile, minute, many-branched), glabrescent; buds pubescent; leaves opposite, petiolate, the petiole about 1 cm long and 1 mm in diameter, deeply channelled above, sparsely stellate-pubescent, or some of the hairs simple; blades ovate to elliptic, the larger about 7 cm long and 4 cm wide, sharply acuminate at apex, broadly cuneate at base, entire, green above, paler beneath, conspicuously ciliate,

[8] Contr. U.S. Nat. Herb. **23**: 1397. 1926.

the midrib above and beneath beset with both stellate and simple hairs, the leaf tissue glabrous; principal veins about 4 pairs, arcuate-ascending, anastomosing; peduncle up to 4.5 cm long, about 1.25 mm thick, minutely stellate-puberulent; bracts at base of inflorescence deciduous, not seen; cyme twice compound, up to 3.5 cm high and 4.5 cm broad, the primary rays about 5, up to 1.5 cm long, the secondary shorter, all densely stellate-puberulent, very sparingly red-glandular; bractlets of inflorescence small, deciduous, those subtending the flowers longer than the calyx tube, ciliolate; calyx tube cylindric-obconic, about 1.5 mm long, densely red-glandular, sparingly beset with both simple and stellate hairs; calyx lobes deltoid, about 0.75 mm long, acute, ciliate, otherwise glabrous; corolla about 4 mm long, open-campanulate, glabrous, the lobes rounded; stamens exserted, the filaments about 4 mm long, glabrous, the anthers oval, about 1 mm long; style glabrous.

Type in the U.S. National Herbarium, no. 1,493,953, collected in canyons at the base of the Nevada de Colima, Jalisco, Mexico, May 23, 1893, by C. G. Pringle (no. 4384). Duplicates are at the University of California, the Field Museum, the Gray Herbarium, the Missouri Botanical Garden, and the New York Botanical Garden.

Known only from the original material, distributed as *Viburnum microphyllum* Hemsl.?, to which species it is probably most closely related. Examination of the type of *V. microphyllum*, however, shows that the two plants are specifically distant. *V. dispar* differs not only in the characters enumerated in the key, but also is strikingly unlike in its leaves and in general habit.

13. Viburnum acutifolium Benth. Pl. Hartw. 59. 1840.

Branchlets terete or slightly angular, 3 to 4 mm in diameter, glabrate, slightly stellate-pubescent at nodes; buds sparingly pubescent; leaves opposite, petiolate, the petiole short (5 to 10 mm long) deeply channelled above, glabrous; blades ovate or ovate-lanceolate, small, the larger ones about 6 cm long and 3 cm wide, acute at apex, rounded at base, entire, or occasionally with a few marginal glands, green above, paler beneath, glabrous above except for a few minute hairs on the depressed midvein, wholly glabrous beneath, ciliate or nonciliate; principal veins about 5, inconspicuous, arcuate and anastomosing; peduncle up to 4 cm long, slender, bearing a few scattered stellate hairs; bracts at base of inflorescence deciduous, linear-oblanceolate, about 9 mm long, narrowed at base; cyme twice compound, up to 3 cm long and 5 cm wide, the primary rays 5 to 7, up to 18 mm long, the secondary short, all very sparsely stellate-pubescent, slightly red-glandular; bractlets of inflorescence linear-oblanceolate, glabrous on the back, ciliate, those subtending the flowers obviously longer than the calyx tube; calyx tube cylindric-obconic, about 1.5 mm long, glabrous, sparingly red-glandular; calyx lobes broadly deltoid, about 0.75 mm long, glabrous on the back, ciliate; corolla white, fragrant, 2 to 3 mm long, open-campanulate, glabrous, the lobes rounded; stamens slightly exserted; style glabrous.

Type in the Kew Herbarium, collected at Cerro Pelado, Oaxaca, Mexico, by Hartweg (no. 449).

Additional specimens examined:

Mexico: Pine woods, mountains of Oaxaca, 2,300–3,000 meters, June 1840, *Galeotti* 3095 (K). Cerro de Zempoaltepec, Oaxaca, June 1842, *Liebmann* 7807 (Co, K). Northwest slope of Zempoaltepec, Oaxaca, alt. 2,600–3,300 meters, July 10, 1894, *Nelson* 676 (N). Cerro de Yalina, Dist. Villa Alta, Oaxaca, alt. 1,500 meters, June 1899, *Conzatti* 954 (G). Sierra de Reyes, Oaxaca, alt. 3,150 meters, Nov. 9, 1894, *Pringle* 5631 (G).

The Pringle specimen is the only one bearing mature fruit, and is not certainly conspecific with the flowering specimens. The fruit is much flattened (about 9 mm long, 6 mm wide, and 2.5 mm thick), and is tipped with the persistent, erect

calyx lobes. It is deeply sulcate on one face and the two internal "spurious" cells are conspicuous.

Another specimen doubtfully referred to this species was collected east of Cerro Santa María Papalo, Distr. Cuicatlan, Oaxaca, alt. 2,500 meters, June 16–22, 1898, by Conzatti and Gonzalez (no. 766; G). It may represent a distinct species.

14. Viburnum jucundum Morton, sp. nov.

Sect. *Disjuncta.* Ramuli robusti, crassi, dense tomentosi, pilis stellatis flavescentibus; petioli robusti, dense stellato-tomentosi; laminae foliorum ovatae, apice acuminatae, basi rotundatae vel cuneatae, glanuloso-serratae, supra stellato-pilosae, pilis sessilibus, 5–7–radiatis, subtus dense stellato-tomentosae, pilis breviter stipitatis multiradiatis; pedunculi breves, robusti, dense tomentosi; cymae radii dense stellato-tomentosi; calycis tubus obconicus stellato-tomentosus; calycis lobi breves, obtusiusculi, extus dense stellato-tomentosi; corolla dense stellato-pubescens; stamina exserta; stylus glaber.

Small tree, 3 to 5 meters high, branchlets terete, robust, 4 to 5 mm thick, densely matted-tomentose, the hairs yellowish, stellate; buds densely pubescent; leaves opposite, petiolate, the petiole of the larger leaves very robust, about 3 mm thick, up to 16 mm long, densely stellate-tomentose; blades ovate, the larger about 13 cm long and 9 cm wide, sharply short-acuminate at apex, rounded to broadly cuneate at base, conspicuously glandular-serrate to the base, densely stellate-pilose above (the hairs sessile, 5- to 7-branched), paler beneath, densely stellate-tomentose, the hairs short-stipitate, with many (more than 15) radiately spreading branches; principal lateral veins 3 to 5, arcuate, reaching the margin, slightly impressed above, elevated beneath; peduncle short, stout, about 18 mm long and 3 mm thick, densely tomentose like the branchlets; bracts at base of inflorescence deciduous; cyme 4 times compound, about 4.5 cm high, 10 cm wide, the primary rays 6, up to 3 cm long, secondary rays up to 1.7 cm long, all densely stellate-tomentose; bractlets of inflorescence deciduous; calyx tube obconic, about 1.5 mm long, completely covered with a dense stellate yellowish tomentum; calyx lobes short, about 0.6 mm long, obtusish, densely stellate-tomentose without, glabrous within; corolla white, open-campanulate, 3.5 mm long, conspicuously stellate pubescent externally, the hairs small, sessile, many-branched; stamens long-exserted, the filaments linear-subulate, about 4.5 mm long, the anthers elliptic, about 1 mm long; style glabrous.

Type in the Gray Herbarium, collected in Chiapas, Mexico, 1864–70, by A. Ghiesbreght (no. 729).

This species is notable for its large, remarkably tomentose leaves, robust branchlets, and densely pubescent corolla. It is probably most nearly related to *Viburnum discolor* Benth.

15. Viburnum disjunctum Morton, sp. nov.

Viburnum ferrugineum Donn. Smith, Enum. Pl. Guat. **1**: 16. 1889. Not *Oreinotinus ferrugineus* Oerst. 1861.

Sect. *Disjuncta.* Ramuli brunneo-tomentosi, pilis numerosis, stellatis, sessilibus, multiradiatis; petioli dense stellato-pubescentes; laminae foliorum lanceolato-ovatae vel ovatae, magnae, apice acuminatae, basi rotundatae et complicatae, integrae vel remote denticulatae, supra stellato-pubescentes, pilis sessilibus, subtus stellato-tomentosae, pilis sessilibus vel substipitatis multiradiatis; bracteae lineares, utrinque stellato-pubescentes; cymae radii dense stellato-pubescentes; bracteolae oblanceolatae, basi angustatae, dense stellato-pubescentes; calycis tubus brevis, dense albo-tomentosus; calycis lobi breves, stellato-pubescentes, ciliati; corolla campanulata, extus pilis simplicibus parce instructa; stylus glaber.

Branches thick, terete, glabrescent; branchlets densely brown-tomentose, the hairs stellate, close, sessile, with many spreading branches; bud scales densely pubescent; leaves opposite, petiolate, the petiole up to 2 cm long, very densely stellate-pubescent; blades ovate-lanceolate to lanceolate, the larger up to 18 cm long and 8 cm wide, rounded and complicate at base, acuminate at apex, entire or remotely glandular-denticulate, stellate-pubescent above (the hairs subdistant, sessile, many-branched), paler beneath, stellate-tomentose, the hairs substipitate or sessile, many-branched: primary veins 6 or 7, arcuate-ascending, anastomosing toward the margin; peduncle variable in length, 1.8 to 15 cm long, densely pubescent like the branchlets; bracts at base of inflorescence linear, about 9 mm long, densely stellate-pubescent on both sides; cyme large, up to 11 cm wide and 5 cm long, 3 to 4 times compound, the primary rays about 7, up to 6 cm long, densely pubescent like the branchlets; bractlets at base of flowers oblanceolate, narrowed at base, densely pubescent; calyx tube short, about 1 mm long, densely white-tomentose; calyx lobes short, rounded-deltoid, about 0.5 mm long, stellate-pubescent, ciliate; corolla white, campanulate, about 2.5 mm long, bearing externally a few scattered straight simple hairs; stamens slightly exserted; style glabrous.

Type in the U.S. National Herbarium, no. 1,394,718, collected at Cobán, Dept. Alta Verapaz, Guatemala, alt. about 1,300 meters, June 1886, by H. von Tuerckheim (no. 977). Duplicates at the Gray Herbarium and the New York Botanical Garden.

ADDITIONAL SPECIMENS EXAMINED:

GUATEMALA: Cobán, alt. 1,350 meters, July 1912, *von Tuerckheim* 2438 (F, N).

This striking species has been confused with *Oreinotinus ferrugineus* Oerst. (= *Viburnum ferrugineum* Donn. Smith [not Raf.] = *V. anabaptista* Graebn.), a South American species of which I have seen the type from the Copenhagen Herbarium. The latter species is obviously different in the dense woolly tomentum of the under surface of the leaves (in which the individual hairs can scarcely be distinguished) and the much smaller and more compact cymes.

16. Viburnum discolor Benth. Pl. Hartw. 83. 1840.

Shrub or small tree, up to 7 meters high; branches glabrous, shining, slightly ribbed; branchlets somewhat angular, about 2.5 mm in diameter, stellate-pubescent, the hairs short-stipitate, many- (at least 10-) branched; bud scales densely stellate-tomentose outside, glabrous within; leaves opposite, petiolate, the petioles 10 to 14 mm long, broadened at base, sulcate above, densely stellate-tomentose like the branchlets; blades ovate to slightly obovate, the largest 7.5 cm long and about 4.7 cm wide, cuneate or rounded at base, abruptly short-acuminate at apex or merely acute, margin revolute, sparsely and irregularly toothed (the teeth glandular), above deep green, densely pubescent on the impressed midvein, sparsely stellate-pubescent on the leaf surface (hairs sessile, the branches 4 to 10, spreading), pale beneath, densely white-stellate-puberulent (hairs sessile or short-stipitate, the branches spreading, very numerous, over 10); principal veins 4 or 5 to a side, elevated beneath, impressed above, arcuate-ascending, anastomosing toward the margin; peduncle 5 to 6 cm long, about 1.5 mm wide, the pubescence dense, similar to that of the branchlets; bracts at base of inflorescence deciduous, not seen; cyme convex, thrice compound, about 3.5 cm long and 5 cm broad, the primary rays 5 or 6, 6 to 14 mm long at anthesis, 11 to 25 mm long in fruit, the secondary rays several, shorter, up to 8 mm long, the tertiary rays similar, all densely pubescent like the branchlets; flowers sessile at the end of the tertiary rays, mostly in pairs, subtended by linear-subulate pubescent bractlets, slightly longer than the calyx tube; calyx tube obconic, about 1.5 mm long, completely

covered with a dense tomentum of white stellate hairs; calyx lobes ovate, acute, about 0.75 mm long, sparsely white-hirtellous, ciliate; corolla white, campanulate, 3 to 3.5 mm long, 2 mm wide at base, the limb about 5 mm across, the lobes about equal to the tube, obtuse, glandular-margined, the tube beset with stiff whitish hairs, those toward the base sessile and stellate (with 3 to 5 branches), the upper ones simple; filaments subulate, about equal to the corolla; anthers oval, 1 to 1.25 mm long, sagittate; style glabrous; ovary 1-celled, the ovule solitary, pendulous from the apex of the cell; fruit (immature) ellipsoidal, with persistent style and calyx lobes, stellate-pubescent.

Type in the Kew Herbarium, collected at Totonicapán, Guatemala, by Hartweg (no. 579).

ADDITIONAL SPECIMENS EXAMINED:

GUATEMALA: *Bernouilli & Cario* 1942 (K). Oak forest at Chichavac, Dept. Chimaltenango, alt. 2,600–3,000 meters, November–December 1930, *Skutch* 58 (B, Co, N).

A most distinct species, without near relatives.

17. Viburnum stellato-tomentosum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881.

Oreinotinus stellato-tomentosus Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 283. 1861.

Oreinotinus wendlandi Oerst. loc. cit.

Viburnum wendlandi Hemsl. loc. cit.

Viburnum stellato-pilosum Polak. Linnaea **41**: 564. 1877.

Tree or shrub 2 to 8 meters high; branchlets stout, terete, glabrous in age, densely stellate-tomentose when young; leaves opposite, petiolate, the petiole 6 to 10 mm long, 1.5 to 2 mm thick, scarcely channelled above, densely stellate-tomentose; blades very variable in shape, ovate, elliptic, or oblong-obovate, the larger 12 cm long and 7 cm wide, acute at apex, cuneate and complicate at base, conspicuously toothed or rarely subentire, with conspicuous marginal glands near the base, pubescent on the upper leaf surface with scattered stellate hairs (these sessile, many-branched), densely stellate-tomentose beneath, the hairs long-stipitate, many-branched; principal veins about 5, anastomosing or reaching the margin; peduncle variable in length, up to 8 cm long and 2.5 mm thick, terete, densely stellate-tomentose; bracts at base of inflorescence deciduous; cyme 3 to 4 times compound, up to 4.5 cm long and 10 cm wide, the primary rays about 7, up to 3 cm long, densely stellate-tomentose, sparsely red-glandular; bractlets of inflorescence very minute, sparingly stellate-pubescent, those subtending the flowers not so scarcely exceeding the calyx tube; calyx tube small, 1 to 1.5 mm long, conspicuously red-glandular, not or only very sparsely pubescent, the hairs stellate or simple; calyx lobes broadly deltoid, about 1 mm long, rounded at apex, glabrous on the back, ciliate; corolla white rotate-campanulate, about 3 mm long, glabrous, the lobes rounded, spreading; stamens exserted, the filaments flattened, glabrous, the anthers subrotund, about 0.75 mm long; style glabrous; fruit black, ellipsoidal or subsphaeroidal, 5 to 6 mm long, about 5 mm wide and thick, glabrous, grooved on one surface, the intrusion conspicuous.

Type in the Copenhagen Herbarium, collected on Volcán Irazú, Costa Rica, alt. about 3,000 meters, January 1847, by Oersted (no. 7818). Duplicate at Kew.

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Volcán Irazú, alt. 2,600 meters, Apr. 16, 1857, *Wendland* 657 (Co; type collection of *Oreinotinus wendlandi* Oerst.). Above San Rafaël de Cartago, alt. 1,700 meters, Oct. 18, 1894, *Pittier* (Herb. Nat. Cost. 9031; N). Forests at La Verbena, near Alajuelita, alt. about 1,000 meters, August 1894, *Tonduz* (Herb. Nat. Cost. 8881; N). Río

Reventado, Prov. Cartago, alt. 2,000 meters, April 1894, *J. D. Smith* 4830 (G, N). Gorges of the Río Virilla, near San Juan, Prov. San José, Dec. 14, 1913, *Tonduz* (Herb. Nat. Cost. 17923; N). Río Tibas, San Juan, January 1913, alt. 1,200 meters, *Jiménez* 824 (N); Nov. 10, 1913, alt. 1,200–1,300 meters, *Jiménez* 917 (N). Banks of Río Virilla, Prov. San José, alt. 1,100 meters, December 1895, *Tonduz* 7230 (Herb. Nat. Cost. 9812; F, G, N). Las Cóncavas, August 1919, *Lankester* K 281 (F, K). Cartago, alt. 1,600 meters, Aug. 24, 1924, *Rojas* 63 (N). Cerro de Piedra Blanca, above Escasu, Prov. San José, Jan. 31, 1924, *Standley* 32442 (N). Between Aserrí and Tarbaca, Prov. San José, alt. 1,600–1,900 meters, Feb. 12, 1924, *Standley* 34038 (N). Cerro de la Carpintera, Prov. Cartago, alt. 1,500–1,850 meters, February 1924, *Standley* 34507 (N), 34510 (N), 35474 (N). Vicinity of San José, alt. about 1,150 meters, February 1924, *Standley* 34821a (N). Vicinity of Santa María de Dota, Prov. San José, alt. 1,500–1,800 meters, Dec. 14–26, 1925, *Standley* 42456 (N). Volcán Irazú, alt. 2,100 meters, Jan. 21, 1916, *Holway* 451 (N).

This, the commonest species of Costa Rica, is a round-topped tree with black edible fruit. It is known by the name "tirrá" or "currá" or "surá," names also applied to other species of *Viburnum* in Costa Rica.

18. Viburnum sulcatum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881. *Oreinotinus sulcatus* Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 287. 1861.

Branches angled, sulcate, 2.5 to 3 mm thick, inconspicuously stellate-pubescent, the hairs small, sessile, many-branched; branchlets obviously stellate-pubescent, the hairs larger and more numerous; bud scales pubescent; leaves opposite, petiolate, the petiole 7 to 9 mm long, sulcate, densely stellate-pubescent; blades ovate, the larger 7 to 8 cm long, 4 to 4.5 cm broad, rounded or subcordate at base, sharply acuminate at apex, entire, green above, much paler beneath, glabrous above except for a few scattered stellate hairs on the mesophyll, these more numerous on the midrib, beneath everywhere densely stellate-puberulent, the hairs yellowish, rather small, sessile, many branched; primary veins 6 or 7, arcuate-ascending, anastomosing toward the margin, deeply impressed above, elevated beneath; peduncle 2.5 to 3.2 cm long, similar to the branchlets; bracts at base of inflorescence deciduous, linear, about 3.5 mm long, pubescent on the back; cyme small, 2 to 2.5 cm wide, 4 times compound; primary rays 7 to 8 mm long, all the rays densely stellate-pubescent like the branchlets; pedicels 1 to 1.5 mm long; bractlets of inflorescence concave, stellate-pubescent externally; calyx tube subcylindric, bearing numerous red glands and a few short simple hairs; calyx lobes deltoid, acute, sparingly pubescent, ciliate; style glabrous; stigmas 3, capitate.

Type in the Copenhagen Herbarium, collected by Liebmann on Cerro de Zempoaltepec, Oaxaca, Mexico, June 1842. Duplicate at Kew.

The description of the calyx tube, calyx lobes, and style is drawn from material in the pocket, not certainly of the same species as the mounted specimen, which is in young bud. Proper description of this species must await further collections from Mount Zempoaltepec.

19. Viburnum optatum Morton, sp. nov.

Sect. *Optata*. Rami angulati, glabri; ramuli nitidi, glabrati; petioli glabrati; laminae ovatae vel oblongo-ovatae, apice longe acuminatae, basi cuneatae, integrae, ciliatae, supra glabrae (venis exceptis), subtus venis hirsutae, alioqui glabrae; pedunculus glaber; cymae radii glabri; bracteae inflorescentiae lineares vel oblongo-lineares, glabrae, non ciliatae; calycis tubus glaber, eglandulosus; calycis lobi glabri, non vel vix ciliati; corolla campanulato-rotata, glabra; stylus albo-villosus.

Branches stout, angular, dull, glabrous, with numerous lenticels; branchlets slender, shining, glabrate, bearing a few spreading hairs; leaves opposite, petiolate, the petiole up to 1 cm long, deeply channelled above, glabrate, bearing a few simple hairs toward the apex; blades ovate to oblong-ovate, the larger 8.5 cm long by 3.5 cm wide, sharply long-acuminate at apex, cuneate and slightly complicate at base, entire, glabrous above except on the principal veins, beneath paler, glabrous on the surface, and conspicuously hirsute on the midvein and lateral veins, conspicuously ciliate, bearded in the vein axils, the hairs once-furcate at base; lateral veins about 5, arcuate-ascending, anastomosing toward the margin; peduncle 2.6 to 3.3 cm long, glabrous; bracts at base of inflorescence deciduous; cyme up to 5.5 cm wide and 2.8 cm long, the primary rays 6 or 7, up to 13 mm long, glabrous; bracts of inflorescence linear to linear-oblong, not narrowed at base, glabrous, not ciliate; terminal flowers sessile, lateral pedicellate, the pedicels short; calyx tube about 1.5 mm long, glabrous, eglandular; calyx lobes deltoid, about 0.75 mm long, acute or rounded, glabrous, not or scarcely ciliate; corolla campanulate-rotate, about 3 mm long, glabrous; stamens slightly exserted, the filaments about 3 mm long, inserted at base of corolla, the anthers explanate, about 1 mm long; style densely white-villous; stigmas inconspicuous.

Type in the Gray Herbarium, collected at Jacaltenango, Dept. Huehuetenango, Guatemala, Apr. 9, 1896, by C. & E. Seler (no. 2639). Duplicate at the New York Botanical Garden.

A peculiar species, evidently forming a distinct section of the genus.

19a. Viburnum optatum var. **vagum** Morton, var. nov.

Ramuli glabri; petioli glabri; laminae foliorum ovatae ad ovales (raro obovatae), apice longe acuminatae, basi cuneatae vel truncatae, integrae vel parce serratae, utrinque omnino glabrae (venis axillis exceptis), parce ciliatae; pedunculus glaber; cymae radii glabri (nodis exceptis); bracteae inflorescentiae lanceolatae, parce ciliatae; calycis tubus cylindrico-obconicus, glaber; calycis lobi deltoidei, parce ciliati; corolla campanulato-rotata, glabra; stylus albo-pubescens.

Branchlets terete, about 2.5 mm thick, glabrous, shining; buds glabrous or with a few long hairs at apex; leaves opposite, petiolate, the petiole 9 to 10 mm long, about 1 mm thick, glabrous; blades ovate to oval (rarely obovate), the largest 9.5 cm long and 4.2 cm wide, sharply long-acuminate, broadly cuneate or truncate at base, entire except for 1 or 2 pairs of glandular teeth near the base (or some of the leaves conspicuously and sharply serrate, the teeth glandular, few), green above, pale beneath, glabrous on both surfaces (the principal veins not pubescent either above or beneath), barbate in the vein axils beneath, ciliate near apex, sometimes sparingly so; principal veins about 4, arcuate, anastomosing in entire-margined leaves, running to the teeth in serrate leaves; peduncle 4 to 5 cm long, about 2 mm thick, glabrous; bracts at base of inflorescence deciduous; cyme 3 to 4 times compound, up to 7 cm high and 11 cm wide, the primary rays 5 to 7, up to 4 cm long, glabrous, the secondary rays much shorter and slenderer, short-pubescent at the nodes; flowers mostly pedicellate, the pedicels short, glabrous; bractlets of inflorescence small, lanceolate, sparsely ciliate, deciduous; calyx tube cylindric-obconic, about 1.5 mm long, glabrous; calyx lobes deltoid, about 0.7 mm long, sparsely ciliate; corolla campanulate-rotate, about 3 mm long, glabrous, the lobes rounded; stamens exserted; style white-pubescent at base.

Type in the U.S. National Herbarium, no. 1,390,003, collected at San Miguel Uspantán, Dept. Quiché, Guatemala, alt. about 2,100 meters, April 1892, by Heyde and Lux (J. D. Smith, no. 3042). Duplicates in the New York Botanical Garden and Gray Herbarium.

ADDITIONAL SPECIMENS EXAMINED:

GUATEMALA: Las Bordes, Dept. Santa Rosa, alt. about 1,050 meters, May 1892, *Heyde & Lux* (J. D. Smith, no. 3162; G, N).

The cilia of the leaf margins are very inconspicuous in this variety and are somewhat deciduous. The absence of pubescence on the veins is characteristic.

20. Viburnum membranaceum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 2. 1881.

Oreinotinus membranaceus Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 284. 1861.

Branches dark, slender, glabrous, with short internodes, lenticels few; branchlets at first densely stellate-tomentose with matted, sessile, long, many-branched hairs, becoming glabrate; leaves opposite, petiolate, the petiole short, up to 6 mm long, densely stellate-tomentose, the blades ovate, the larger about 5 cm long by 3.5 cm wide, slightly cordate at base, sharply short-acuminate, conspicuously serrate from near middle to apex (the teeth about 7 to a side), almost glabrous above (the hairs few, scattered, stellate, sessile, 2- to 4-branched, more numerous on the midrib), sparsely substrigose on the veins beneath (the hairs partly simple, partly stellate), conspicuously ciliate; primary veins about 5, impressed above, elevated beneath, almost straight; peduncle 15 to 22 mm long, equaling or shorter than the cyme, glabrescent, glandular; bracts at base of inflorescence deciduous, linear, about 6 mm long, 0.5 mm wide, pubescent externally; cyme 3 to 4 cm wide, twice compound, the primary rays about 7, up to 14 mm long, stellate-tomentose, densely glandular (the glands red, stipitate), the secondary rays shorter; pedicels very short; bractlets subtending the flowers linear, acuminate, ciliate, longer than the calyx tube; calyx tube subcylindric, almost glabrous, very sparingly glandular; calyx lobes deltoid, about 0.75 mm long, acutish, glabrous on the back, conspicuously ciliate; corolla campanulate, about 3 mm long, glabrous; stamens slightly exserted; style densely short-pubescent.

Type in the Copenhagen Herbarium, collected at Cuesta de San Juan del Estado, Oaxaca, Mexico, alt. 2,300 meters, by Liebmann (no. 7813). Duplicate at Kew.

Known only from the original collection.

21. Viburnum ciliatum Greenm. Proc. Amer. Acad. **41**: 251. 1905.

Branches angulate, about 2 mm thick, glabrous, lenticels few; branchlets similar, sparsely glandular, when young laxly hirsutulous; bud scales glabrous, ciliate; leaves opposite, short-petiolate, the petiole canaliculate, 3 to 4 mm long, sparsely pubescent; blades broadly ovate, the larger about 6.5 cm long and 4.7 cm wide, cordate at base, sharply short-acuminate at apex, conspicuously serrate almost to base (the teeth numerous), when young sparsely strigose above (the hairs mostly simple, rarely furcate at base), glabrate at maturity, beneath glandular, hirsutulous along the midrib and veins, glabrate at maturity, conspicuously ciliate; primary veins 6 or 7, running straight to the margin; peduncle variable in length, 5 to 19 mm long, bearing scattered simple hairs, obviously glandular; bracts at base of inflorescence linear-lanceolate, not leaflike, up to 7 mm long, ciliate; cyme loose, up to 5.5 cm wide and 3 cm long, twice compound; primary rays about 5, up to 15 mm long, glabrous, glandular, secondary rays shorter; bractlets at base of flowers linear, about 3.5 mm long, ciliate; calyx tube subcylindric, glabrous; calyx lobes deltoid, about 1 mm long, acute, glabrous, not or sparingly ciliate; corolla rotate, about 7 mm wide, 4 mm long, glabrous; anthers exserted, oval, 1 mm long; style white-villous; stigmas three.

Type collected in wet woodlands near Trinidad Iron Works, Hidalgo, Mexico, alt. 1,780 meters, Apr. 30, 1904, by C. G. Pringle (no. 8881; C, F, G, M, N, Y).

Known only from the type collection.

22. Viburnum caudatum Greenm. Proc. Amer. Acad. **41**: 250. 1905.

Branches terete, glabrous; branchlets similar, sparingly stipitate-glandular; bud scales glutinous, sparingly stipitate-glandular; leaves opposite, petiolate, the petiole canaliculate, up to 1.5 cm long, conspicuously stipitate-glandular; blades rhombic-ovate, the larger 12.5 cm long and 8.5 cm wide, cordate or rounded at base, abruptly and acutely short-acuminate at apex, entire or undulate below, sometimes with a few teeth, bearing 3 or 4 conspicuous marginal glands toward the base, deep green above, glabrate at maturity, beneath paler, glabrate, glandular, bearded in the vein axils with long white stellate hairs; primary veins 4 to 6, straight, anastomosing near the margin; peduncle 3 to 4.5 cm long, conspicuously stipitate-glandular; bracts at base of inflorescence long, linear, glandular; cyme up to 8 cm broad and 4.5 cm long, twice or thrice compound, the primary rays 6 or 7, up to 2 cm long, the secondary much shorter, all densely stipitate-glandular; bractlets subtending the flowers linear, glandular, longer than the calyx tube; calyx tube cylindric, about 13 mm long, densely stipitate-glandular; calyx lobes about 0.75 mm long, obtuse, ciliate, not or scarcely glandular; corolla rotate, about 6.5 mm wide, 4 mm long, glabrous, the lobes rounded, spreading; filaments long-exserted, about 8 mm long; anthers oval, about 1 mm long; style densely villous; stigmas 3; fruit ellipsoidal, about 6 mm long, 4 mm wide, and 3 mm thick, scarcely fleshy, deeply sulcate ventrally, the intrusion conspicuous, bilobed, shallowly sulcate dorsally.

Type collected in the barranca below Trinidad Iron Works, Hidalgo, Mexico, alt. 1,500 meters, May 24, 1904, by C. G. Pringle (no. 8826; C, Co, F, G, M, N, Y). Fruiting material was collected at the same locality on Aug. 21, 1905, *Pringle* 10037 (C, Co, F, G, M, N, Y).

An additional specimen referred to this species was collected at Misantla, Sierra Madre, Veracruz, August 1912, *Purpus* 6024 (C, M, Y). It differs from the type in several particulars and may represent a recognizable variety.

23. Viburnum loeseneri Graebn. Repert. Sp. Nov. Fedde **12**: 244. 1913.

Branchlets slightly angular, dark gray, not at all shining, densely stellate-tomentose when young, glabrate with age, very irregular, with numerous lenticels and longitudinal ridges; buds densely tomentose; leaves opposite, petiolate, the petiole short (up to 5 mm long), densely stellate-tomentose; blades ovate, very small (the larger 5 cm long and 2.5 cm wide), acute at apex, rounded at base, entire or remotely denticulate, substrigose above (the hairs mostly simple except on the principal veins), much paler beneath, sparsely glandular, stellate-pilose, the hairs sessile, several- to many-branched; primary veins about 3, arcuate-ascending, anastomosing; peduncle 1.5 to 2.5 cm long, about 1.5 mm in diameter, densely stellate-tomentose; bracts at base of inflorescence linear, about 5 mm long, 0.75 mm wide, densely stellate-tomentose externally; cyme twice compound, very small (the largest 2.2 cm long and 3 cm wide), the primary rays about 6, up to 6 mm long, the secondary very short, all densely stellate-tomentose; bractlets of inflorescence linear or linear-lanceolate, stellate-pubescent externally, those subtending the flowers about equaling the calyx tube; calyx tube cylindric-obconic, about 1.5 mm long, somewhat stellate-pubescent, sparingly glandular; calyx lobes deltoid, about 0.75 mm long, stellate-pilose toward the tip, the hairs deciduous with age; corolla campanulate, about 3.5 mm long, sparingly stellate-pubescent externally; stamens included; style short-pubescent.

Type (not seen) in the Berlin Herbarium, collected in Mexico by Ehrenberg. There is, however, an Ehrenberg specimen in the U. S. National Herbarium which agrees in all details with the original description and is almost certainly a specimen of the type collection.

Additional specimens examined:

Mexico: Tapalpa, Jalisco, June 10, 1892, *M. E. Jones* 121 (M, N).

The small leaves, the distribution of pubescence, the comparatively small cymes, and the large flowers all distinguish this species satisfactorily.

24. Viburnum hirsutum Morton, sp. nov.

Sect. *Serrata.* Ramuli teretes, juventute hirsuti, pilis simplicibus vel stellatis sessilibus 2- to 4-radiatis glandulis rubris intermixtis, demum glabrati; petioli dense hirsuti; laminæ foliorum rhombeae, magnae, apice breviter acuminatae, basi subcordata integrae sursum paullulum serratae (dentibus brevibus vix glandulosis), supra dense strigosae, subtus sparse glandulosae, stellato-pubescentes, pilis sessilibus, paucis, pauciradiatis; pedunculi dense hirsuti et glandulosi; bracteae lineares, apice acutae, extus substrigosae; cymae radii dense hirsuti, rubroglandulosi; bracteolae lineares, pilosae et glandulosae; calycis tubus dense viscoso-glandulosus, hirsutus; calycis lobi deltoidei, acuti, dense strigosi; corolla rotata, glabra; stamina exserta; stylus pubescens.

Branchlets terete, up to 2.5 cm thick, glabrous, the young twigs of the season densely hirsute (hairs simple or stellate, 2- to 4-branched, sessile, mixed with red glands), the internodes very short, up to 2 cm long; buds glabrate, shining; leaves near the ends of the branchlets only, opposite, petiolate, the petiole short (about 1 cm long), very densely hirsute like the branchlets; blades rhombic, large, up to 12.5 cm long and 9 cm wide, sharply short-acuminate at apex, subcordate at base, entire below, slightly serrate toward the apex (the teeth low, scarcely glandular), densely strigose above, beneath paler, sparsely glandular and stellate-pubescent, the hairs sessile, with few long, spreading branches; principal veins about 7, once or twice furcate; peduncle 3 to 3.5 mm long, very densely hirsute and glandular; bracts at base of inflorescence subpersistent, linear, about 10 mm long, 1 mm wide, acute at apex, substrigose externally; cyme twice compound, up to 3 cm high and 6 cm wide, the primary rays 7, about 1.5 cm long, the secondary very short, all densely hirsute, red-glandular; bractlets of inflorescence subpersistent, linear, pilose and glandular; calyx tube 1.5 to 2 mm long, densely viscid-glandular and hirsute; calyx lobes deltoid, about 1 mm long, acute, densely strigose; corolla rotate, 3 mm long, glabrous, the lobes broadly rounded; stamens exserted, the filaments about 5.5 mm long, glabrous; style short-pubescent.

Type in the U.S. National Herbarium, no. 1,012,274, collected at Cerro La Raya, Dist. Cuicatlan, Oaxaca, Mexico, alt. 2,500 meters, Apr. 15, 1919, by Conzatti and Gomez (no. 3476).

This remarkable species, which has no near relative, is known from the single collection cited.

25. Viburnum stenocalyx (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881.
Oreinotinus stenocalyx Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 285. 1861.

Branchlets densely tomentose, the hairs matted, stellate, sessile, with many long, spreading branches; leaves opposite, petiolate, the petiole canaliculate, up to 1 cm long, densely stellate-tomentose; blades ovate-lanceolate or rarely obovate, the larger about 9 cm long by 4 cm wide, rounded at base, acute at apex, conspicuously dentate, the teeth very numerous, extending almost to the base of the blade, paler beneath, thinly substrigose above (the hairs usually simple, sometimes furcate at the base, rarely stellate, with 3 to 5 antrorse branches), stellate-pubescent beneath (the hairs sessile, with long silky branches, chiefly on the veins and veinlets), conspicuously ciliate; primary veins about 6, arcuate-ascending, slightly impressed above and elevated beneath, reaching the margin; peduncle about 2 cm long, densely tomentose like the branchlets; bracts at base of inflorescence leaflike, persistent, linear-oblanceolate or oblanceolate, about 17 mm long, about 2.5 mm wide above the middle, narrowed at base, pilose, entire; cyme up to 13 cm wide, 5 cm long, 3 to 4 times compound, the primary rays 6 or 7, up to 2.7 cm long, the secondary much shorter, all densely tomentose like the

branchlets, glandular; terminal flowers sessile, lateral pedicellate, the pedicels very short; bractlets subtending the flowers linear, pilose, ciliate, longer than the calyx tube; calyx tube 1 to 1.25 mm long, glabrous or with a few hairs toward the apex, glandular; calyx lobes oblong, 1 to 1.75 mm long, obtuse at apex, glabrous or with a few scattered hairs, ciliate; corolla campanulate, 2.5 to 3 mm long, glabrous or with a few scattered hairs, the lobes rounded; style white-villous at base; stigmas 3, capitate; fruit black, ellipsoidal, somewhat fleshy, about 7 mm long, 5 mm wide, and 4 mm thick, slightly sulcate ventrally, the intrusion very conspicuous, long-stalked.

Type in the Copenhagen Herbarium, collected in Mexico by Ehrenberg. An Ehrenberg collection in the herbarium of the University of California is probably part of the type material.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Canada, above Contreras Station, Federal District, alt. 2,400 meters, Sept. 17, 1906, *Pringle* 10310 (C, Co, F, G, M, N, Y). By streams, base of Sierra de Ajusco, Federal District, alt. 2,250 meters, September–October 1896, *Pringle* 6569 (C, F, G, M, N, Y). Thickets near Eslaba, Federal District, alt. 2,400 meters, Nov. 13. 1903, *Pringle* 11466½ (Co, F, G, N). Cerro de las Nalgos, Morelia, alt. 2,300 meters, January 1910, *Nicolas* (N). Woods, Eslaba, Valley of Mexico, Federal District, alt. 2,400 meters, May 18, 1901, *Pringle* 9373 (G, N, Y). Ixtaccihuatl, March–July 1903, *Purpus* 163 (C, G, M, N).

This distinctive species has previously been misidentified as *Viburnum stellatum* (Oerst.) Hemsl., to which it is scarcely related. The original material of *V. stenocalyx* has unusually long calyx lobes but is not otherwise distinguishable from the other specimens here cited.

26. Viburnum microcarpum Schlecht. & Cham. Linnaea **5**: 170. 1830. *Viburnum microcarpum* var. *evanescens* Greenm. Proc. Amer. Acad. **35**: 313. 1900.

Tree 4.5 to 6 meters high; branches glabrous, shining, 3 to 3.5 mm thick, with long internodes; branchlets white-tomentose when young, the hairs stellate, matted; leaves opposite, borne chiefly on short lateral branchlets, petiolate, the petiole up to 1 cm long, very densely stellate-tomentose, the hairs white, sessile, many-branched; blades rhombic, obovate, or broadly ovate, the larger up to 9 cm long and 7.7 cm wide, subcordate or rounded at base, merely acute at apex, conspicuously serrate (the teeth numerous, up to 15 on each side), entire toward the base, here with a few marginal glands, deep green above, glabrous (even when young) except on the sunken midvein, reticulate-veined, cano-tomentose beneath, the hairs stellate, sessile, many-branched; primary veins 6 or 7, impressed above, elevated beneath, straight, running to the marginal teeth; peduncle variable in length, very short or up to 3.4 cm long, pubescent like the branchlets; bracts at base of inflorescence not seen; cyme large, up to 10.5 cm wide and 5 cm long, thrice compound, the primary rays about 7, up to 3 cm long, the secondary much shorter, all rather sparsely stellate-pubescent, glandular; terminal flowers sessile, the lateral short-pedicellate; bractlets subtending the flowers linear, shorter than the calyx tube; calyx tube cylindric, about 3 mm long, glabrous or minutely glandular; calyx lobes short, about 0.5 mm long, obtuse or acute, sparsely ciliate; corolla white, subrotate, about 5 mm wide, 3 mm long, glabrous; filaments exserted, about 3 mm long, glabrous; anthers oval, about 1 mm long; style villous; fruit black, very small (3.5 to 4 mm long, 3.5 mm wide, and 3 mm thick), slightly fleshy (the juice red), deeply sulcate ventrally, the intrusion large, conspicuously bilobed.

Type collected between Jalapa and San Miguel del Soldado, Veracruz, by Schiede.

ADDITIONAL SPECIMENS EXAMINED.

MEXICO: Type collection (M, Y). San Miguel del Soldado, Veracruz, alt. 1,800 meters, Apr. 20, 1899, *Pringle* 8172 (type coll. of var. *evanescens* Greenm.; C, Co, F, G, M, N, Y). Jalapa, Veracruz, April 1838, *Linden* 529 (K). Chinantla, Puebla, alt. 2,100 meters, May 1841, *Liebmann* (Co, K).

The original material of *V. microcarpum* is a mixture of two species, one (in the flowering stage) with orbicular, subcordate, sinuate-denticulate leaves, stellate pubescent above, the other (in fruiting condition) with rhombic or obovate, serrate leaves, glabrous above. Although the original description contains almost equally characters derived from both elements, the species should be typified on the fruiting material, as indicated by the author's choice of the peculiarly appropriate specific name, *microcarpum*, the fruits being in fact the smallest known for any tropical member of the genus. In this fruiting material, the glabrous condition of the upper surface of the leaves is not a matter of age, as shown by Liebmann's specimens, in which even the youngest are without a trace of pubescence above. Moreover, the pubescence of the under leaf surface is not quite the same. The differences in leaf shape and dentition are also conspicuous.

The other component of the original species has been described as *V. tiliaefolium* (Oerst.) Hemsl. on specimens collected by Sartorius.

27. Viburnum tiliaefolium (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881.

Oreinotinus tiliaefolius Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 282. 1861.

Viburnum microcarpum Schlecht. & Cham. Linnaea **5**: 170. 1830, in part.

Branches sulcate, about 5 mm thick, glabrous; branchlets densely stellate-tomentose when young, the hairs sessile, mostly with numerous short spreading branches; bud scales densely pubescent; leaves opposite, petiolate, the petiole up to 1.6 cm long, densely stellate-tomentose; blades broadly ovate or suborbicular, the larger up to 16 cm long and 11.5 cm wide, subcordate at base, acute at apex, sinuate-denticulate (the teeth numerous, very short, passing into marginal glands toward the base), densely stellate-pubescent above (the hairs sessile, few to many-branched), pale beneath with a very dense pubescence of stellate, sessile or stipitate many-branched hairs; primary veins 6 or 7, conspicuously elevated beneath, running to the marginal teeth; peduncle variable in length (0.7 cm to 4.2 cm long), densely pubescent like the branches; bracts at base of inflorescence not seen; cyme large, 3 to 4 times compound, spreading, up to 11 cm broad and 5 cm long, the primary rays 5 to 7, up to 3 cm long, the secondary much shorter, all rather densely stellate-pubescent, sparingly red-glandular: terminal flowers sessile, the lateral pedicellate; bractlets subtending the flowers linear, very small, shorter than the calyx tube; calyx tube subcylindric, about 2 mm long, red-glandular, bearing a few small hairs toward apex; calyx lobes short (0.75 to 1 mm long), obtusish, sparsely pubescent on the back, ciliate; corolla about 5 mm wide, 2 to 3 mm long, glabrous; stamens slightly exserted, glabrous; style villous; stigmas 3, conspicuous; fruit black, ellipsoidal, 5 to 6 mm long, 3.5 mm wide, and 3 mm thick, the intrusion prominent, bilobed.

Type in the Copenhagen Herbarium, collected between Mirador and Jalapa, Veracruz, July 1842, by Sartorius.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Jalapa, Veracruz, *Schiede* (G, M, Y). Orizaba, July 1857, *Mohr* (N); June 1855, *Botteri* 983 (K).

This species is discussed under *V. microcarpum*. The Liebmann specimen referred to this species by Oersted is a quite different and probably undescribed species.

A specimen collected at Honey Station, Puebla, by Pringle (no. 10807; G) probably represents a new species of this relationship also.

28. Viburnum rhombifolium (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881.

Oreinotinus rhombifolius Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 282. 1861.

Branchlets slender, about 3 mm in diameter, glabrous and shining in age, pubescent when young, the hairs stellate, sessile, with numerous spreading branches; buds sparingly stellate-pubescent; leaves opposite, petiolate, the petiole up to 12 mm long, channelled above, densely stellate-pubescent, sparingly red-glandular; blades large, rhombic-ovate, the larger about 14 cm long and 9 cm wide, slightly attenuate toward apex, rounded at base, conspicuously and regularly sinuate-dentate from base to apex (the teeth glandular), stellate-pubescent above (the hairs sessile, with 2 or 3, rarely 5, long, spreading branches), more densely pubescent beneath, the hairs stellate, sessile, many-branched, the branches more than 10, spreading; primary veins about 6, straight, reaching the margin; peduncle terete, 3.5 to 4 cm long, pubescent like the young branchlets; bractlets at base of inflorescence linear, not leaflike, subpersistent, about 5 mm long, densely stellate-pubescent externally, glabrous on the inner surface; cyme thrice compound, about 4 cm long and 7 cm wide, the primary rays 5 or 6, up to 2.2 cm long, the secondary short, stellate-pubescent like the branchlets, conspicuously red-glandular; bractlets of inflorescence linear; calyx tube cylindric, 2 mm long, glabrous, sparingly glandular; calyx lobes elongate-triangular, 1.5 mm long, acute, erect, glabrous except for a few cilia; corolla rotate-campanulate, about 3 mm long, glabrous; stamens exserted, the filaments about 3 mm long, glabrous; style densely short-pubescent.

Founded on two specimens in the Kew Herbarium, collected on Mount Orizaba, Veracruz, Mexico, by Linden (no. 531), August 1838, and by Galeotti (no. 2667), June–October 1840, mounted on the same sheet, which are very similar. The one collected by Galeotti may be designated as the type.

This species is known only from these two collections.

29. Viburnum pubescens (Ait.) Pursh, Fl. Amer. Sept. **1**: 202. 1814.

Viburnum dentatum var. *pubescens* Ait. Hort. Kew. **1**: 372. 1789.

Two specimens from central Mexico are tentatively referred to this common species of the eastern United States: Near Toluca, April 1834, *Andrieux* 341 (K) and San Bartolo, Federal District, May 1928, *Lyonnet* 331 (N). The determination of their actual relationship to the various forms of *Viburnum pubescens* must await further study.

30. Viburnum stellatum (Oerst.) Hemsl. Biol. Centr. Amer. Bot. **2**: 3. 1881.

Oreinotinus stellatus Oerst. Naturhist. For. Kjöbenhavn Vid. Medd. **1860**: 292. 1861.

Branches terete, 2.5 mm thick, glabrous, shining, with conspicuous lenticels; branchlets slender, terete, closely stellate-tomentose, the hairs stellate, sessile, with numerous long, spreading branches; bud scales almost glabrous; leaves opposite, petiolate, the petioles canaliculate, up to 1 cm long, densely tomentose like the branchlets; blades oval, the larger about 9.5 cm long by 4.7 to 5 cm wide, cuneate at base, sharply long-acuminate at apex, minutely denticulate, green above, paler beneath, above with scattered stellate hairs, these few- or many- (up to 8-) branched, beneath with scattered stellate hairs, these chiefly on the veins and veinlets; primary veins 5 or 6, impressed above, elevated beneath,

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arcuate-ascending, anastomosing toward the margin; peduncle 4 to 5 cm long, 1.5 mm thick, tomentose like the branchlets; bracts at base of inflorescence leaflike, petiolate (the petioles about 5 mm long), the blade about 1.5 cm long, pubescent like the leaves; cyme twice or thrice compound, about 5 cm across, the primary rays 6 or 7, up to 2 cm long, densely tomentose, the secondary rays shorter; terminal flowers sessile, the lateral short-pedicellate; bractlets subtending the flowers small, linear, shorter than or equaling the calyx tube, sparsely hairy; calyx tube obconic, glabrous or with a few short simple hairs, sparsely glandular; calyx lobes deltoid, concave, about 0.75 mm long, acutish, glabrous on the back, ciliate; corolla about 5.5 mm wide, 3 mm long, glabrous or with a few scattered hairs, the lobes rounded; filaments glabrous, about 2.5 mm long; anthers exserted, oval, about 1 mm long; style glabrous.

Type in the Copenhagen Herbarium, collected on Mount Orizaba, Mexico, alt. 2,600 meters, September 1841, by Liebmann (no. 7806).

The second specimen cited by Oersted (Volcán Irazú, Costa Rica, alt. 2,700 meters, January 1847, *Oersted* 7819; Co) is not identical with the type from Orizaba and may represent a distinct species or variety. Further material is necessary to make a proper decision.

Viburnum stellatum is not closely related to any other Mexican or Central American species, and when better known will probably be found to represent a distinct section or subsection of the genus.

DOUBTFUL SPECIES

VIBURNUM PARVIFLORUM Mart. & Gal. Bull. Acad. Brux. **11**[1]: 243. 1844.

Founded on *Galeotti* 7138, collected at Zacatepec, Oaxaca, Mexico. No specimens have been examined.

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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

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NEW SPECIES OF PILEA FROM THE ANDES

By ELLSWORTH P. KILLIP

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II

PREFACE

The accompanying paper by Ellsworth P. Killip, associate curator, division of plants, United States National Museum, contains descriptions of numerous new species of *Pilea*, a genus of the family Urticaceae, which reaches its greatest development in the West Indies and western South America. As a member of three botanical expeditions to the Andes, Mr. Killip made extensive field observations and assembled a large series of specimens. These, with the rich collections in the more important herbaria of the United States and Europe, have served as the basis of a thorough revision of the genus as represented in the Andes; but publication of the complete manuscript being unavoidably delayed, it seems desirable to publish descriptions of the new species in the meantime. Of the 111 species treated in the key, 30 are here first described, three are renamed, and two are raised from varietal to specific rank with change of name.

FREDERICK V. COVILLE,
Curator, United States National Herbarium.

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NEW SPECIES OF PILEA FROM THE ANDES

By Ellsworth P. Killip

INTRODUCTION

As a result of recent botanical exploration in the Andes of South America, there has been assembled a large number of specimens of the urticaceous genus *Pilea*. In the course of studying this material I have prepared a monograph of all the Andean species, giving a key, descriptions of the new species as well as diagnoses of those already known, and a complete citation of the synonymy and of the herbarium specimens examined. Since the publication of this manuscript is unavoidably delayed, it seems desirable to publish at the present time descriptions of the new species, and with these a key to all the Andean species, in order to show better the relationship of the new ones. The area covered embraces the whole of Venezuela, Colombia, Ecuador, Peru, Bolivia, and Chile, including the low-lying regions as well as the cordilleras. In view of the restricted character of the present paper, it is not possible to discuss the synonymy or to give in detail the geographical distribution of the species previously described.

The method of treating the genus here followed is mainly that of Weddell,[1] although admittedly it is rather artificial and perhaps does not indicate the true interrelationship of the species. Many of the species being dioecious, our present knowledge is often based solely on one kind of plant—the staminate or the pistillate—so that a more natural grouping, such as one based on the shape of the staminate perianth or the shape and size of the achenes, is not at present practicable.

In the course of these studies I have examined material in most of the principal herbaria[2] of Europe and this country, and I wish

[1] Arch. Mus. Hist. Nat. (Paris) 9: 172–277. 1856–57; DC. Prodr. 16 [1]: 32–235. 1869.

[2] The herbaria in which specimens cited in the present paper have been seen are indicated thus: B, Botanisches Museum, Berlin; BM, British Museum (Natural History); F, Field Museum of Natural History; G, Gray Herbarium of Harvard University; Gen, Jardin Botanique, Geneva; K, Royal Botanic Gardens, Kew; Ma, Jardín Botánico, Madrid; N, U. S. National Museum; Par, Muséum d'Histoire Naturelle, Paris; Ph, Academy of Natural Sciences, Philadelphia; Y, New York Botanical Garden.

to express to the directors of these institutions my appreciation of their generous cooperation.

KEY TO THE GROUPS AND SPECIES

Leaves all entire, sometimes obscurely crenulate in *P. serpyllacea* and *P. nitida*.
Plants usually monoecious.
Leaves faintly 1-nerved, less than 1 cm long ..... I. MICROPHYLLAE.
Leaves 3-nerved or triplinerved, usually more than 1 cm long ..... II. PARIETARIAE.
Leaves (at least the larger one of a node) toothed.
Leaves pinnately 1-nerved (no pair of secondary nerves more prominent than the others) ..... III. FALLACES.
Leaves (at least the smaller one of a node) 3-nerved or triplinerved.
Leaves of a node dissimilar or very unequal (sometimes similar and subequal in *P. flexuosa*), the larger more than twice as long as the smaller.
Plants mainly dioecious.
Stipules inconspicuous, less than 3 mm long, soon deciduous.
Leaves appearing to be in fours at the nodes, owing to the presence of a very short branchlet bearing a pair of leaves at its base (imperfectly so arranged in *P. weberbaueri*) ..... IV. DIVERSIFOLIAE.
Leaves otherwise.
Smaller leaf of a pair oblique, subentire; pistillate cymes sessile ..... V. IMPARIFOLIAE.
Smaller leaf symmetrical, toothed, rarely subentire; pistillate cymes pedunculate ..... VI. CENTRADENIOIDEAE.
Stipules conspicuous, 3 mm long or more, persistent ..... VII. FLEXUOSAE.
Leaves of a node similar and equal, or if unequal the larger not more than twice as long as the smaller.
Leaves averaging not more than 2 cm long (longer in *P. jamesoniana* and *P. filipes*); slender, usually prostrate plants, the branches scarcely 10 cm long, the leaves usually densely massed at the ends of the branches (see also *P. nummularifolia*) ..... VIII. DAUCIODORAE.
Leaves averaging much more than 2 cm long; erect herbs or shrubs, more than 10 cm high (or the stem repent with elongate branches), the stem usually leafy throughout.
Plant glabrous throughout.
Staminate flowers in dense globose heads, these solitary and terminating slender elongate peduncles or forming a once- or twice-branched panicle; pistillate flowers in sessile or subsessile cymes shorter than the adjacent petioles (cymes diffusely branched in *P. minutiflora*) ..... IX. CAPITELLATAE.
Staminate flowers in simple or decompound, usually diffuse cymes, the pistillate inflorescence similar ..... X. MULTIFLORAE.
Plant pubescent throughout, or at least with some indument on either stem, petioles, leaves, or inflorescence.
Staminate inflorescence compact, the peduncle longer than the branches; flower heads unisexual ..... XI. MOLLES.
Staminate (or androgynous) inflorescence diffusely branched or, if compact, longer than the peduncles. Plant dioecious or monoecious ..... XII. PUBESCENTES.

I. MICROPHYLLAE

Stem succulent; leaves fleshy, the petiole much shorter than the blade.
Cymes sessile or subsessile; leaves, at least the larger of a pair, obovate or oblong, cuneate.
Cystoliths not elevated, very faint on under surface of leaves; plant suberect, up to 30 cm high (throughout Tropics)—1. **P. microphylla** (L.) Liebm.
Cystoliths strongly elevated, conspicuous on both surfaces of leaves; plant lax, the branches 50 cm long or more (Peru).
2. **P. foliosa** Killip, sp. nov.
Cymes pedunculate, the peduncles usually longer than the leaves; leaves nearly globular, appearing orbicular when dry, rounded at base.
3. **P. serpyllacea** (H. B. K.) Wedd.
Stem not succulent, filiform; leaves not fleshy, the petiole equaling or exceeding the blade—4. **P. herniarioides** (Sw.) Lindl.

II. PARIETARIAE

Staminate flowers borne singly or in pairs; leaves cordate, less than 5 mm long (Peru)—5. **P. nerteroides** Killip.
Staminate flowers in unisexual or androgynous cymes; leaves not cordate, at least 5 mm long (sometimes smaller in *P. nitida*).
Flower clusters sessile, axillary (Peru)—6. **P. nitida** Wedd.
Flower clusters forming panicles, cymes, or spikes.
Cystoliths on lower surface of leaves none or few and inconspicuous (Venezuela and Colombia).
Staminate flowers bracteate; stipules more than 2 mm long, persistent; leaves densely hirsute—7. **P. lindeniana** Wedd.
Staminate flowers ebracteate; stipules less than 2 mm long, soon deciduous; leaves glabrous or sparingly hirsute.
Plant slender, the cymes androgynous, shorter than the petioles; branches almost destitute of cystoliths.
8. **P. rhombea** (L. f.) Liebm.
Plant stout, the cymes unisexual, longer than the petioles; branches densely covered with cystoliths—9. **P. alsinifolia** Wedd.
Cystoliths on lower surface of leaves numerous, conspicuous.
Leaves sessile or subsessile (Colombia)—10. **P. argentea** Killip.
Leaves distinctly petioled.
Segments of staminate flowers mucronulate; cystoliths yellowish (Venezuela)—11. **P. tatei** Killip, sp. nov.
Segments of staminate flowers not mucronulate; cystoliths white.
Leaves ovate; petioles 1 cm or more long (Colombia).
12. **P. aenea** Killip, sp. nov.
Leaves linear-oblong; petioles less than 1 cm long (Ecuador or Peru).
13. **P. angustata** Killip, sp. nov.

III. FALLACES

Petioles more than 1 cm long, longer than the adjacent peduncles (Colombia).
Plant glabrous; staminate inflorescence subtended by an involucre of persistent or deciduous bracts, the perianth lobes long-tipped.
14. **P. lippioides** Killip.
Plant pubescent above (staminate inflorescence unknown).
15. **P. obetiaefolia** Killip.

Petioles not more than 1 cm long, shorter than the adjacent peduncles.
Leaves of a node equal or nearly so, more than 3 times as long as broad.
Stem strigillose above; leaves strigillose on nerves beneath (Ecuador).
16. P. hitchcockii Killip.
Stem and leaves glabrous (Bolivia).
Leaves ovate-lanceolate or oblong-lanceolate, distinctly petioled, coarsely crenate-serrate, the teeth ascending_____ **17. P. sublobata** Rusby.
Leaves narrowly obovate or oblanceolate, sessile or subsessile, sharply serrate, the teeth divaricate_____ **18. P. pauciserrata** Killip.
Leaves of a node unequal, less than 3 times as long as broad.
Plant glabrous throughout; leaves up to 1.2 cm long (Ecuador).
19. P. trichosanthes Wedd.
Plant with stem and usually leaves pubescent.
Larger leaves 2 to 5 cm long, with 7 to 10 serrations to a side; coarse, suberect suffrutescent herb_____ **20. P. fallax** Wedd.
Larger leaves 0.8 to 2 cm long, with 4 to 6 serrations to a side; slender, lax herb (Colombia)_____ **21. P. vegasana** Killip, sp. nov.

IV. Diversifoliae

Branches and petioles glabrous; stipules less than 2 mm long.
Larger leaves more than 4 mm wide (Peru)__ **22. P. nutans** (Poepp.) Wedd.
Larger leaves not more than 4 mm wide.
Cymes sessile; leaves about as broad as long, 3-toothed at apex; sepals bearing cystoliths (Ecuador)_____ **23. P. myriophylla** Killip, sp. nov.
Cymes pedunculate; leaves prevailingly much longer than broad, several-toothed; sepals without cystoliths (Peru).
Leaves with conspicuous cystoliths; larger leaves with only 4 or 5 faint secondary nerves_____ **24. P. diversifolia** Wedd.
Leaves without cystoliths; larger leaves with 8 or more secondary nerves, these prominent beneath_____ **25. P. weberbaueri** Killip, sp. nov.
Branches and petioles densely pubescent; stipules more than 2 mm long (Peru).
Leaves up to 6 mm long and 4 mm wide, the cystoliths conspicuous.
26. P. pulegifolia (Poir.) Wedd.
Leaves much larger, the cystoliths faint beneath.
27. P. ramosissima Killip, sp. nov.

V. Imparifoliae

Larger leaf suborbicular, not more than 1.5 cm long, rounded.
28. P. filicina Killip.
Larger leaf ovate, obovate, or oblanceolate, more than 1.5 cm long, acute or acuminate, rarely subacute.
Smaller leaf more than 7 times shorter than the larger leaf; larger leaves strongly oblique.
Cystoliths linear and punctiform on upper surface of leaves, conspicuous; larger leaves ovate or elliptic-ovate, more than 3 cm wide (Peru).
29. P. bassleriana Killip, sp. nov.
Cystoliths all linear on upper surface of leaves, faint; larger leaves oblanceolate, less than 3 cm wide (Colombia)___ **30. P. daguensis** Killip.
Smaller leaf proportionately longer; larger leaves symmetrical or nearly so.
31. P. imparifolia Wedd.

VI. Centradenioideae

Plant with stem and under side of leaf nerves pubescent (western coastal Colombia).
Leaves crenate-serrate, the teeth rounded, ascending; nerves not white-fasciate ..... 32. **P. trianaeana** Wedd.
Leaves, at least the larger, sharply serrate, the upper margin of teeth nearly normal to midnerve; nerves white-fasciate above.
Larger leaf caudate-acuminate, 10- to 12-toothed on each side, the petioles slender, about 1 cm long ..... 33. **P. centradenioides** Seem.
Larger leaf acuminate, 14- to 16-toothed on each side, sessile or short-petioled ..... 34. **P. seemannii** Killip.
Plant glabrous throughout.
Larger leaf not more than 3.5 cm long.
Achenes more than 1 mm wide, strongly costate at center of each face (Peru) ..... 35. **P. costata** Killip, sp. nov.
Achenes not more than 1 mm wide, ecostate.
Leaves 3-nerved, the cystoliths on upper surface punctiform (Peru). 36. **P. pichisana** Killip, sp. nov.
Leaves triplinerved, the cystoliths on upper surface linear (Colombia). 37. **P. rojasiana** Killip, sp. nov.
Larger leaf more than 3.5 cm long.
Cystoliths of leaves stellate, 3-rayed ..... 38. **P. crugeriana** Wedd.
Cystoliths of leaves simple, either linear, fusiform, or punctiform.
Larger leaves more than 3.5 cm wide, more than 5 times longer than the smaller leaves (Peru) ..... 39. **P. haenkei** Killip, sp. nov.
Larger leaves not more than 3.5 cm wide, less than 5 times longer than the smaller leaves.
Teeth of leaves with filiform tips; cystoliths on upper surface of leaves more than 0.5 mm long (Peru). 40. **P. macrocystolithica** Killip, sp. nov.
Teeth of leaves not filiform-tipped; cystoliths of leaves not more than 0.5 mm long.
Staminate inflorescence subumbellate, borne on long filiform peduncles, the flowers long-pediceled (Colombia). 41. **P. hydrocotyliflora** Killip, sp. nov.
Staminate inflorescence cymose or cymose-paniculate, the flowers sessile or subsessile.
Perianth of staminate flowers 2 mm wide or more, the lobes with long subulate tips (Colombia). 42. **P. macrantha** Killip, sp. nov.
Perianth of staminate flowers smaller, the lobes at most short-mucronulate (Ecuador; Colombia?). 43. **P. tetrapoda** Killip, sp. nov.

VII. Flexuosae

Stem herbaceous, succulent, straw-colored; leaves broadly ovate, rounded or cordate at base (Colombia and Ecuador) ..... 44. **P. flexuosa** Wedd.
Stem woody; leaves elliptic-lanceolate or ovate-lanceolate, narrowed at base (Bolivia) ..... 45. **P. cymbifolia** Rusby.

VIII. Dauciodorae

Leaves incised-serrate or coarsely crenate-dentate; cymes androgynous.
Plant pubescent; leaves incised-serrate (Venezuela)... **46. P. urticella** Wedd.
Plant glabrous; leaves coarsely crenate-dentate (Peru).
47. P. lamioides Wedd.
Leaves serrulate or crenate-serrulate (sharply serrate in *P. serratifolia*); cymes usually unisexual.
Pistillate cymes sessile.
Leaves orbicular, serrulate (Peru)..... **48. P. dombeyana** Wedd.
Leaves ovate, sharply serrate (Ecuador)..... **49. P. serratifolia** Wedd.
Pistillate cymes with slender peduncles; leaves ovate or spatulate (suborbicular in *P. pusilla*).
Stem densely pubescent..... **50. P. strigosa** Wedd.
Stem glabrous.
Cystoliths on lower surface of leaves punctiform.
Achenes less than 1 mm wide; leaves suborbicular or subreniform, usually broader than long (Peru)..... **51. P. pusilla** Krause.
Achenes more than 1 mm wide; leaves ovate-lanceolate to rhombic-orbicular.
Leaves ovate-lanceolate, sharply serrate, the teeth mucronate; plants dioecious (Peru)..... **52. P. delicatula** Killip.
Leaves rhombic-orbicular or rhombic-ovate, crenate-serrate, the teeth obtuse; plants usually monoecious (Chile).
53. P. elliptica Hook. f.
Cystoliths on lower surface of leaves linear or fusiform (linear and punctiform in *P. filipes*).
Stipules not more than 2 mm long, deciduous or subpersistent; leaves averaging less than 2 cm long.
Leaves ovate or orbicular-ovate, usually broadest below middle, toothed nearly to base, bearing small linear and fusiform cystoliths, glabrous..... **54. P. dauciodora** Wedd.
Leaves spatulate or rhombic, toothed only in upper half, bearing conspicuous filiform cystoliths, usually sparsely pilosulous.
55. P. leptophylla Killip.
Stipules more than 2 mm long, persistent; leaves averaging at least 2 cm long.
Achenes more than 1 mm long; crenations of leaves undulate (Ecuador)..... **56. P. jamesoniana** Wedd.
Achenes not more than 1 mm long; crenations of leaves entire (Bolivia)..... **57. P. filipes** Rusby.

IX. Capitellatae

Lateral nerves extending scarcely beyond middle of blade (Colombia).
58. P. discolor Killip, sp. nov.
Lateral nerves extending well above middle of blade.
Pistillate inflorescence cymose-paniculate, diffuse (Peru).
59. P. minutiflora Krause.
Pistillate inflorescence in small, sessile or subsessile cymes.
Plants dioecious.
Cystoliths on upper surface of leaves punctiform; lateral leaf nerves extending to apex of blade.

Leaves more than 7 cm long, acute or obtuse at base, bearing punctiform cystoliths beneath (Bolivia)---------- **60. P. capitellata** Wedd.

Leaves less than 7 cm long, cordulate at base, bearing linear, very conspicuous cystoliths beneath (Colombia)- **61. P. cuprea** Krause.

Cystoliths on upper surface of leaves linear or fusiform; lateral leaf nerves extending only to upper third of blade.

Leaves broadly ovate, membranous, bearing punctiform cystoliths beneath (Ecuador)---------- **62. P. tungurahuae** Killip, sp. nov.

Leaves rhombic-ovate, subcoriaceous, bearing linear cystoliths beneath (Colombia)---------- **63. P. rhombifolia** Killip.

Plants monoecious.

Leaves averaging less than 1 cm wide; plant drying light green (Colombia)---------- **64. P. pennellii** Killip.

Leaves averaging more than 1 cm wide; plant drying dark green.

Stem woody; leaves ovate, not more than twice as long as wide (Peru)---------- **65. P. macbridei** Killip.

Stem herbaceous; leaves oblong-lanceolate or elliptic-lanceolate, much more than twice as long as wide (Chile)---- **66. P. elegans** Gay.

X. Multiflorae

Petioles very stout, conspicuously winged; leaves at least 12 cm long (Colombia)---------- **67. P. pteropodon** Wedd.

Petioles slenderer, not winged; leaves usually less than 12 cm long.

Leaves coarsely, usually sharply, dentate.

Stipules persistent; petioles not more than 1 cm long; leaves carnose, narrowly lanceolate; stem stramineous in drying-- 68. **P. carnulosa** Wedd.

Stipules soon deciduous; petioles more than 1 cm long; leaves ovate or broadly lanceolate; stem darker in drying.

Pistillate cymes diffuse, the peduncles elongate; leaves rounded or cordate at base; achenes about 1 mm long---- **69. P. smithii** Killip, sp. nov.

Pistillate cymes compact, sessile or subsessile; leaves usually subcuneate at base; achenes less than 0.5 mm long---- **103. P. hyalina** Fenzl.

Leaves not coarsely or sharply dentate.

Cystoliths stellate with 3 rays.

Leaves undulate or minutely denticulate toward apex, the petioles usually more than 2 cm long (Peru)---------- **70. P. marginata** Wedd.

Leaves crenate-serrate to below middle, the petioles less than 2 cm long (Venezuela)---------- **71. P. triradiata** Killip, sp. nov.

Cystoliths otherwise.

Petioles (at least the longer of a node) more than 3 cm long; leaves caudate-acuminate.

Panicles diffusely branched, at least 5 cm wide; leaves broadly ovate, the nerves not reaching to acumen (Bolivia).

72. P. rusbyi (Britton) Killip.

Panicles less than 5 cm wide; leaves ovate-lanceolate or elliptic-lanceolate, the nerves reaching to acumen (Colombia).

Achenes 1 mm long; staminate inflorescence borne above the pistillate; leaves 3-nerved---------- **73. P. puracensis** Killip.

Achenes 0.5 mm long; staminate inflorescence borne below the pistillate; leaves triplinerved.

74. P. antioquensis Killip, sp. nov.

Petioles rarely more than 3 cm long.
Leaves broadly ovate, at least 5 cm wide, borne mainly near end of the simple stem, triplinerved, the lateral nerves arising well above base (Bolivia)_____ **75. P. buchtienii** Killip.
Leaves ovate or ovate-lanceolate, less than 5 cm wide, borne throughout stem or its branches.
Stem strongly verrucose-roughened, woody; leaves averaging less than 3 cm long (Peru)_____ **76. P. verrucosa** Killip.
Stem smooth, usually herbaceous; leaves averaging more than 3 cm long.
Lobes of staminate perianth segments apiculate (Colombia).
77. P. apiculata Killip, sp. nov.
Lobes of staminate perianth segments not apiculate.
Staminate inflorescence less than 2 cm long, sessile or subsessile (Peru).
Leaves lanceolate or oblong-lanceolate, more than twice as long as broad, sessile or subsessile, usually amplexicaul.
78. P. subamplexicaulis Killip, sp. nov.
Leaves elliptic or ovate-elliptic, less than twice as long as broad, with well-developed petioles.
79. P. punctata (H. B. K.) Wedd.
Staminate inflorescence more than 2 cm long, pedunculate, often diffusely cymose-paniculate.
Achenes muriculate, thickened at margin; leaves narrowly elliptic-lanceolate, usually more than 4 times as long as broad (Ecuador)_____ **80. P. attenuata** Killip, sp. nov.
Achenes smooth, not thickened at margin; leaves proportionately broader.
Pistillate cymes sessile or short-peduncled, shorter than or rarely subequal to the adjacent petioles.
Leaves toothed only in upper half (Colombia).
81. P. mutisiana (Spreng.) Wedd.
Leaves toothed nearly to base.
Petioles 3 cm long or more; branches of inflorescence alternate; flowers sessile (Colombia and Ecuador).
82. P. myriantha Killip.
Petioles less than 3 cm long; branches of inflorescence dichotomous; flowers pedicellate (Colombia).
Stipules more than 1 mm long; upper surface of leaves scabrid, densely covered with elevated punctiform cystoliths_ **83. P. goudotiana** Wedd.
Stipules not more than 1 mm long; upper surface of leaves smooth, the cystoliths all linear or fusiform_____ **84. P. losensis** Killip, sp. nov.
Pistillate cymes long-peduncled, much longer than the adjacent petioles.
Cystoliths on upper surface of leaves more than 0.5 mm long, coarse, all fusiform; leaves thick-carnose.
85. P. suffruticosa Krause.
Cystoliths on upper surface of leaves shorter and finer, linear, punctiform, or rarely fusiform; leaves usually of thinner texture.

Achenes minute, about 0.5 mm long; leaves obtuse or short-acuminate (Peru)__ **86. P. citriodora** Wedd.
Achenes large, 1 to 1.5 mm long; leaves long-acuminate.
Stipules 3 to 10 mm long, persistent (Colombia and Peru)_____ **87. P. poeppigiana** Wedd.
Stipules less than 3 mm long, soon deciduous.
Leaves oblong-lanceolate to ovate-lanceolate, the petioles (at least the longer at a node) more than 1 cm long, the teeth subequal (Peru and Bolivia)_____ **88. P. multiflora** (Poir.) Wedd.
Leaves narrowly lanceolate, sessile or subsessile, the teeth larger toward apex (Bolivia).
89. P. macrophylla Rusby.

XI. MOLLES

Flowers of staminate inflorescence in a simple globose umbel about 1.5 cm wide, the pedicels longer than the flowers, densely hirsute (Venezuela).
90. P. mollis Wedd.
Flowers of staminate inflorescence in compact, often globose cymes, the pedicels usually shorter than the flowers.
Nerves extending to apex of blade; peduncles of staminate heads more than 4 cm long (Venezuela)_____ **91. P. forgeti** N. E. Br.
Nerves extending only to upper third of blade; peduncles of staminate heads less than 4 cm long.
Plants monoecious, the staminate inflorescence borne at the lower nodes, the pistillate at the upper; achenes costate (Colombia).
92. P. pittieri Killip.
Plants dioecious, the inflorescence borne mainly at the upper nodes; achenes ecostate.
Leaves ovate, sharply serrate, thin-membranous (Colombia).
93. P. tatamensis Killip.
Leaves rhombic to rhombic-elliptic, rarely broadly ovate, doubly crenate-serrate, subcarnose.
Staminate perianth lobes ovate, merely mucronulate, the mucro about 0.5 mm long (Peru)_____ **94. P. submissa** Wedd.
Staminate perianth lobes filiform, about 2 mm long.
Plant suffrutescent; petioles more than 2 cm long; leaves ovate or elliptic-obovate, rounded or cordulate at base, the cystoliths linear (Venezuela and Colombia)_____ **95. P. latifolia** Wedd.
Plant herbaceous; petioles not more than 2 cm long; leaves rhombic-ovate, usually acute at base, the cystoliths fusiform and punctiform (Colombia)_____ **96. P. gallowayana** Killip, sp. nov.

XII. PUBESCENTES

Stem repent or trailing, with nearly equal internodes, leafy and with branches at every node; leaves all orbicular___ **97. P. nummularifolia** (Sw.) Wedd.
Stem erect, repent only at base; at least principal leaves ovate or rhombic to elliptic.
Leaves massed at end of stem or a few, much smaller, at lower nodes; lower internodes much longer than upper; inflorescence mainly in upper axils.
Petioles usually more than 2 cm long; leaves coarsely and sharply dentate, acuminate; plants dioecious_____ **98. P. acuminata** Liebm.

Petioles usually less than 2 cm. long; leaves crenate-serrate, obtuse or acute (acuminate in *P. ceratocalyx*); plants monoecious.

Upper surface of leaves with cystoliths usually at margin only; leaves mainly obovate, rounded at apex (Venezuela and Colombia).

99. P. involucrata (Sims) Urban.

Upper surface of leaves covered with cystoliths; leaves ovate or elliptic, subacute or acuminate.

Cystoliths on upper surface of leaves punctiform (a few fusiform), elevated, dense.

Leaves acuminate, densely hirsute above (Peru?).

100. P. ceratocalyx Wedd.

Leaves subacute, glabrous above (Peru and Bolivia).

101. P. spruceana Wedd.

Cystoliths on upper surface of leaves all linear or fusiform, scarcely elevated, sparse---------- **102. P. pubescens** Liebm.

Leaves of nearly equal size at all the nodes, the internodes subequal; inflorescence (at least pistillate) not confined to upper axils.

Plant annual, slender, with a pellucid stem; cymes androgynous, the staminate flowers very few (throughout Tropics).

103. P. hyalina Fenzl.

Plant perennial, with a coarse ligneous or subligneous stem.

Leaves narrowly lanceolate, less than 2.5 cm wide, sharply serrate; plant with numerous short, very leafy branches from a main woody stem (Colombia and Ecuador)------- **104. P. arguta** (H. B. K.) Wedd.

Leaves ovate to ovate-oblong or oblong-lanceolate, more than 2.5 cm wide; plant with a simple or few-branched stem.

Stipules large and persistent, 1.5 cm long or more (Colombia).

105. P. fasciata Wedd.

Stipules smaller, soon deciduous.

Stem densely rufo-hirsute (Peru).

Plants monoecious; leaves short-acuminate- **106. P. pavonii** Wedd.

Plants dioecious; leaves caudate-acuminate.

107. P. hirsuta (Pav.) Wedd.

Stem essentially glabrous, sparingly pubescent in *P. glaucophylla* (Colombia).

Lateral nerves close to margin of leaf; leaves tomentose on nerves beneath; staminate inflorescence much longer than petioles.

108. P. purpurea Killip.

Lateral nerves a third to halfway between margin of leaf and midnerve; leaves pilosulous on nerves beneath; staminate inflorescence shorter than or subequal to petioles.

Achenes averaging 0.6 mm long; leaves strongly glaucous beneath---------- **109. P. glaucophylla** Killip, sp. nov.

Achenes averaging more than 1 mm long; leaves at most slightly paler beneath.

Plants monoecious; leaves ovate, coarsely serrate, the cystoliths linear and fusiform.

110. P. salentana Killip, sp. nov.

Plants dioecious; leaves oblanceolate, serrulate, the cystoliths punctiform and fusiform.

111. P. castronis Killip, sp. nov.

DESCRIPTIONS OF NEW SPECIES

2. Pilea foliosa Killip, sp. nov.

Monoica, glaberrima, caule ramosissimo, foliis numerosissimis integerrimis vel obscure undulatis disparibus, altero obovato basi acuto breviter petiolato, altero subreniformi sessili, cystolithis linearibus elevatis, floribus ♂ in axillis superioribus plerumque solitariis subsessilibus, ♀ solitariis vel 2—4-nis, achaeniis minutissimis.

Succulent herb with lax branches 50 to 150 cm long; stipules minute, barely 2 mm long; leaves of a node unequal and dissimilar, the larger obovate, 5 to 10 mm long, 3 to 4 mm wide, obtuse at apex, acute or subobtuse at base, short (up to 2 mm)-petioled, entire or obscurely undulate, the smaller subreniform, 1.5 to 3 mm wide, sessile, entire, the cystoliths linear, elevated on both surfaces, fewer but larger on under surface; plants monoecious, the staminate flowers usually solitary in the upper nodes, subsessile, the pistillate solitary or in subsessile clusters of 2 to 4; achenes minute, barely 0.3 mm long.

Type in the U. S. National Herbarium, no. 1,463,881, collected in forest at Carpapata (Tarma Valley), Department of Junín, Peru, altitude 3,000 meters, June 7, 1929, by E. P. Killip and A. C. Smith (no. 24400). Duplicates at F and Y.

DISTRIBUTION: Central Peru, at 1,200 to 3,000 meters altitude.

PERU: JUNÍN: Huacapistana, *Killip & Smith* 24281 (F, N, Y). Chanchamayo Valley, *Schunke* 498 (F, N), 678 (F), 992 (N).

Although this species occupies a place in the foregoing key next to *P. microphylla*, it probably is more nearly related to *P. diversifolia*. The two are of similar general habit, and the cystoliths on the leaves are almost identical. The leaves of *P. foliosa*, however, are entire or very obscurely undulate, those of *P. diversifolia* conspicuously toothed.

5. Pilea nerteroides Killip.

Pilea cordifolia Killip, Journ. Washington Acad. Sci. 15: 50. 1925. Not *P. cordifolia* Benth. 1888.

PERU: HUÁNUCO: Tambo de Vaca, alt. 4,200 meters, *Macbride* 4395 (B, F, type, K, N).

11. Pilea tatei Killip, sp. nov.

Herba monoica vel dioica glaberrima, foliis ovatis vel subobovatis apice acuminatis basi subauriculatis integerrimis undulatis trinerviis, cystolithis supra linearibus et fusiformibus obscuris subtus fusiformibus flavescentibus conspicuis, inflorescentiis unisexualibus, ♂ paniculiformibus, floribus in glomerulis densis aggregatis, ♀ similibus sed brevioribus.

Plant erect, 30 cm or more high, glabrous throughout; stem simple, succulent; stipules ovate, about 2 mm long, acute, soon deciduous; petioles 1 to 2.5 cm long, slender, those of a node subequal; leaves ovate or slightly obovate, 3 to 6 cm long, 2 to 4 cm wide, acuminate at apex, subauricular at base, entire or undulate, 3-nerved (lateral nerves extending to apex of blade, the nerves impressed above), subcoriaceous, dark green, the cystoliths of upper surface linear and fusiform, faint, those of lower surface fusiform, yellowish, conspicuous; plants monoecious or dioecious, the inflorescences unisexual, borne in nearly all the axils; staminate flowers in dense, sessile glomerules about 5 mm wide, forming few-branched panicles, the panicles much longer than the petioles, the branches very slender, the perianth about 1.5 mm wide, the lobes mucronulate (teeth 0.2 mm long), the anthers ovate, 1 mm long; pistillate

flowers in loosely flowered clusters, forming panicles similar to but shorter (up to 2 cm long) than the staminate, the perianth segments ovate, unequal; achenes ovate, about 0.5 mm long, acute.

Type in the U. S. National Herbarium, no. 1,230,887, collected in humid forest, Cerro de Turumiquire, State of Anzoatequi, Venezuela, altitude 2,200 meters, in 1925, by G. H. H. Tate (no. 190). Additional material bears Tate's numbers 187 and 188.

On the basis of the entire leaves *P. tatei* is placed at this point, though perhaps it is more closely related to *P. macbridei* and *P. punctata*.

12. **Pilea aenea** Killip, sp. nov.

Herba dioica (?) glaberrima, caulibus crassis, foliis ovatis subobliquis, apice obtuse acuminatis basi subauriculatis, petiolis elongatis integerrimis trinerviis crassis, cystolithis supra linearibus et punctiformibus inconspicuis subtus fusiformibus densissimis conspicuis, inflorescentiis ♂ subspiciformibus, floribus in glomerulis sessilibus densis.

Plant glabrous throughout; stem succulent, stout; stipules soon deciduous; petioles 1 to 4 cm long; leaves ovate, 2 to 4.5 cm long, 1.2 to 2.7 cm wide, obtusely acuminate at apex, subauriculate at base, entire, 3-nerved (lateral nerves reaching to apex of blade), the upper surface copper-colored, bearing numerous minute linear and punctiform cystoliths, the lower surface pale, bearing conspicuous fusiform cystoliths; plants dioecious (?); staminate flowers in dense remote glomerules about 2 mm in diameter forming a spike or a once-branched panicle, the perianth subglobose in bud, covered dorsally with linear cystoliths.

Type in the Jardín Botánico, Madrid, collected in Colombia, between 1760 and 1808, by José Celestino Mutis (no. 1908).

This species is clearly related to *P. argentea*, having a similar cystolithic marking, but the leaves are ovate, not oblong, and have well-developed petioles.

13. **Pilea angustata** Killip, sp. nov.

Herba tenuis glaberrima monoica, foliis angustis lineari-oblongis apice acuminatis basi subauriculatis integerrimis trinerviis, cystolithis supra minimis linearibus inconspicuis, subtus fusiformibus elevatis conspicuis, cymis unisexualibus parvis petiolis brevioribus.

Plant slender, 10 to 15 cm high, glabrous throughout; stipules ovate, about 1 mm long, acute, subpersistent; petioles 5 to 8 mm long, very slender; leaves linear-oblong, 1.5 to 3 cm long, 4 to 5 mm wide, acuminate at apex, subauriculate at base, entire, 3-nerved (lateral nerves extending to upper quarter of blade), membranous, bearing numerous obscure linear cystoliths above and conspicuous elevated fusiform ones beneath; plants monoecious, the cymes unisexual, subequal to or usually shorter than the adjacent petioles; staminate flowers subglobose in bud, purplish distally, pale proximally, the segments obtuse; pistillate flowers with segments unequal, the largest about 0.3 mm long, the achenes minute, ovate, about 0.4 mm long.

Type in the herbarium of the Muséum d'Histoire Naturelle, Paris, collected in Ecuador or Peru by Grisar.

The shape of the leaves at once distinguishes this species from others of this relationship. The cystoliths on the under surface of the leaves are remarkably uniform in shape and are distributed evenly over the whole surface.

It is unfortunate that the locality at which this was collected is so uncertain. In view of other specimens of the Grisar collection which I have seen, I am inclined to believe that it is from Ecuador rather than Peru.

21. Pilea vegasana Killip, sp. nov.

Dioica, caule supra piliis crispatis hyalinis strigilloso, stipulis cordato-orbiculatis persistentibus, foliis grosse serratis inferne integerrimis penninerviis supra sparse strigillosis nunc disparibus dimorphisque, majore rhombeo-lanceolato acuto, minore rhombeo-orbiculato vel orbiculato-spathulato, nunc subaequalibus et similibus, cymis ♀ subsessilibus 2–4-floris, segmentis perigonii subaequalibus, achaeniis late ovatis.

Slender succulent herb, purplish throughout, repent below, at length erect or decumbent, with a well-marked central stem up to 25 cm long and numerous axillary leafy branches, the stem glabrescent below, strigillose above with crispate hyaline hairs; stipules cordate-orbicular, 1 to 3 mm long, hyaline, reticulate, persistent; petioles filiform, 1.5 to 7 mm long; leaves usually oblique, coarsely serrate except in lower third (serrations 4 to 6 to a side), pinnately 1-nerved, with 4 to 7 pairs of lateral nerves, green and sparingly strigillose with hyaline hairs and faintly marked with fusiform cystoliths above, paler, usually conspicuously bluish glaucous, glabrous and marked with larger fusiform cystoliths beneath; leaves of a pair unequal and dissimilar (larger leaf rhombic-lanceolate, 8 to 20 mm long, 4 to 6 mm wide, acute at apex, tapering at base, the smaller one rhombic-orbicular or orbicular-spatulate, 3 to 7 mm long, 2 to 5 mm wide, rounded or acutish at apex, rounded or slightly acute at base), or the leaves of a pair subequal and similar; plants dioecious; pistillate flowers in subsessile, 2- to 4-flowered heads about as long as the adjacent petiole; perianth segments subequal, linear, about 1 mm long; achenes broadly ovate, 1.2 to 1.5 mm long, flattened.

Type in the U. S. National Herbarium, no. 1,356,153, collected along stream in dense woods, vicinity of Las Vegas (east of Bucaramanga), Department of Santander, Colombia (Eastern Cordillera, 2,600 meters altitude), December 23, 1926, by E. P. Killip and A. C. Smith (no. 16043).

DISTRIBUTION: Eastern Cordillera of Colombia, at an altitude of about 2,600 meters.

COLOMBIA: SANTANDER: Las Vegas, *Killip & Smith* 16020 (G, N, Y), 16025 (G, N, Y), 16082 (G, N, Y). Mount San Vicente, near Charta, *Killip & Smith* 18968 (G, N, Y).

This may be only a form of *P. fallax* with much smaller leaves, although the specimens cited above have a much different aspect from typical *P. fallax*. In the case of the type specimen and no. 16025, the leaves of a node are very dissimilar; in the three other specimens they are more nearly alike, all being suborbicular.

The general habit of the plant, the indument, conspicuous, persistent stipules, and the size and shape of achenes are suggestive of *P. auriculata*, a common Central American species with distinctly triplinerved leaves.

23. Pilea myriophylla Killip, sp. nov.

Herba elata dioica, ramis numerosis divaricatis, foliis dense aggregatis valde diversiformibus, cuiusque jugi majore cuneato-obovato apice grosse tridentato basi attenuato 1-nervio vel obscure triplinervio, cystolithis elongatis linearibus, cymis ♀ sessilibus, segmentis perigonii anguste triangulatis cystolithis linearibus ornatis, achaeniis ovatis.

Herb, 40 cm or more high, with a main central stem and numerous lax divaricate branches, glabrous throughout; stipules ovate-triangular, less than 0.5 mm long, soon deciduous; leaves densely crowded on the branches (internodes not more than 5 mm long), appearing in fours owing to the presence at each node of a pair of leaves on very short, secondary branches, bearing elongate

linear cystoliths prominent and elevated beneath, strongly dimorphic, the larger leaves cuneate-obovate, up to 6 mm long and 4 mm wide, coarsely 3-toothed at apex, tapering to a petiole about 1 mm long, 1-nerved or obscurely triplinerved, the smaller leaves orbicular-reniform, 2 to 3 mm long, 3 to 4 mm wide, entire or shallowly toothed, triplinerved; plants dioecious; staminate inflorescence unknown; pistillate cymes sessile, about 3 mm wide, the segments narrowly triangular, unequal (one twice as long as the others), marked with linear cystoliths; achenes ovate, 1 to 1.2 mm long.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected at Uarunamaca, Ecuador, by E. André (no. K1667).

ECUADOR: "4,000–5,000 ft.", *Pearce* (K).

From *P. diversifolia* this is readily distinguished by the shape of the leaves and by the sessile cymes.

25. Pilea weberbaueri Killip, sp. nov.

Dioica? glaberrima, stipulis deciduis, foliis inaequalibus et disparibus, majoribus oblongo-oblanceolatis petiolatis ad apicem 3-5-dentatis nerviis lateralibus numerosis arcuato-ascendentibus prominentibus, minoribus orbiculato-reniformibus sessilibus vel subsessilibus, floribus ♀ in subglobosis capitulis in cymis compactis, pedunculis filiformibus, achaeniis ovatis.

Plant herbaceous, up to 30 cm high, glabrous throughout, the stem repent at base, branched; stipules triangular, 0.5 mm long, soon deciduous; leaves distinctly opposite or sometimes appearing in threes or fours owing to the presence at a node of a pair of leaves on very short secondary branches, relatively thin, concolorous, without cystoliths, minutely black-punctate above, the leaves of a node unequal and dissimilar, the larger leaves oblong-oblanceolate, 7 to 12 mm long, 3 to 6 mm wide, obtusely acuminate at apex, acute at base, petiolate (up to 2 mm), 3- or 5-toothed toward apex, penninerved or obscurely triplinerved, the principal lateral nerves arising near middle of blade, the secondary nerves numerous (8 or more), arcuate-ascending, prominent beneath, the smaller leaves orbicular-reniform, 3 to 5 mm long, 4 to 6 mm wide, sessile or subsessile, shallowly 3-toothed at apex, 3-nerved; plants apparently dioecious; pistillate flowers in dense subglobose clusters in compact cymes 5 to 6 mm wide, the peduncles filiform, up to 8 mm long; perianth segments unequal, the larger about 0.6 mm long; achenes ovate, about 1 mm long.

Type in the herbarium of the Botanisches Museum, Berlin, collected between Palca and Huacapistana, Department of Junín, Peru, altitude 1,900 to 2,000 meters, January 7, 1903, by A. Weberbauer (no. 2022).

The leaves of this species resemble rather closely those of *P. diversifolia* in shape, size, and toothing, but cystoliths are wanting on either surface and the upper side is minutely black-punctate. The foliage is of thinner texture and different nervation. The crowding of the leaves, with the short branchlets at the nodes giving the leaves the appearance of being ternate or quaternate, is not so evident in *P. weberbaueri* as in the other representatives of this group. This arrangement prevails, however, at several of the nodes, and as the proposed species bears so close a resemblance to *P. diversifolia* it is tentatively placed in this group.

It is a pleasure to name this species for Dr. August Weberbauer, who has done so much toward making known the flora of Peru, and who gave generous assistance to Mr. Smith and myself in Lima.

27. Pilea ramosissima Killip, sp. nov.

Planta dioica, caule subligneo ramosissimo glabro, ramis rufo-villosulis, stipulis ovato-orbiculatis subpersistentibus, foliis aggregatis crenato-serratis triner-

viis diversiformibus, cuiusque jugi majore rhombeo-ovato apice obtuso basi cuneato petiolato, minore orbiculato vel ovato-orbiculato subsessili, cystolithis foliorum linearibus, floribus ♀ in cymis ca. 10-fl. tenuipedunculatis, achaeniis orbiculatis laevibus.

Stem elongate, glabrous, with numerous lateral rufo-villosulous branches; stipules ovate-orbicular, 3 to 4 mm long, subpersistent; leaves appearing in fours, owing to the presence at each node of a pair of leaves on short secondary branches, crenate-serrate (serrations 6 to 8 to a side) except at base, 3-nerved, glabrous, rufo-villosulous on nerves beneath, unequal and slightly dissimilar, the larger petiolate (petioles up to 1 cm long, rufo-villosulous), rhombic-ovate, 1 to 3 cm long, 0.7 to 1.5 cm wide, obtuse at apex, cuneate at base, the smaller leaves orbicular or ovate-orbicular, 4 to 5 mm long, subsessile; cystoliths of leaves linear, elevated and conspicuous above, obscure beneath; plants dioecious; pistillate flowers in about 10-flowered compact cymes up to 5 mm wide, the peduncles slender, 1 to 1.3 cm long, the perianth pinkish, the segments unequal, the lateral about half as long as the middle segment; achenes orbicular, about 1 mm wide.

Type in the U. S. National Herbarium, no. 1,192,756, collected at Chaglla, Department of Huánuco, Peru, altitude about 2,800 meters, May 12, 1923, by J. F. Macbride (no. 3650). Duplicates at B, F, K.

DISTRIBUTION: Central Peru, at 2,500 to 2,800 meters altitude.

PERU: CAJAMARCA: Hualgayoc, *Raimondi* 7092 (B).

In a report[3] upon the large collection of Urticaceae made by Macbride in Peru I referred this specimen with some hesitation to *P. pulegifolia*. I have since had an opportunity of making a direct comparison between this plant and the type of *P. pulegifolia*, and now believe that they are not the same. The proposed species differs in having leaves twice as large, with smaller, more numerous teeth. The pubescence of *P. pulegifolia* is more appressed, and the whole plant is of a lighter hue.

29. Pilea bassleriana Killip, sp. nov.

Herba crassa monoica vel dioica glaberrima, foliis valde inaequimagnis et dimorphis, cuiusque jugi majore elliptico ovato-elliptico vel elliptico-lanceolato caudato-acuminato basi cuneato vel subrotundato obliquo subsessili vel breviter petiolato grosse crenato-serrato basi integerrimo triplinervio, minore orbiculato-reniformi valde obliquo leviter crenato-serrato vel subintegro sessili triplinervio, cystolithis in paginis ambis densis linearibus et punctiformibus, cymis ♂ dichotomis, in parte repente caulis orientibus, perianthio 4-partito, laciniis breve apiculatis, cymis ♀ ca. 5-floribus, minimis, achaeniis ovatis papillosis.

Coarse succulent herb, up to 50 cm high, terrestrial or on tree trunks, repent at base, glabrous throughout; stipules triangular-ovate, barely 1 mm long, soon deciduous; leaves of a node strongly unequal and dissimilar, the larger elliptic, ovate-elliptic, or elliptic-lanceolate, 8 to 15 cm long, 2.5 to 7 cm wide, caudate-acuminate at apex, cuneate or subrotund, oblique at base, subsessile or short-petioled (petiole up to 5 mm long), coarsely crenate-serrate except at base, triplinerved (lateral nerves extending to apex of blade), dark green above, paler beneath, densely covered on both surfaces with linear and punctiform cystoliths, punctate beneath, the smaller leaf orbicular-reniform 0.5 to 1.5 cm long, strongly oblique, sessile, shallowly crenate-serrate or subentire, triplinerved; plants monoecious or dioecious; staminate inflorescence in subdichotomous cymes borne along the naked rooting portion of the stem, 3 to 4 cm long including peduncle, the

[3] Journ. Washington Acad. Sci. 15: 54. 1925.

perianth subglobose in bud, about 1 mm in diameter, 4-parted, the segments short-apiculate; pistillate cymes about 5-flowered, up to 8 mm long; achenes ovate, about 1 mm long, papillose.

Type in the U. S. National Herbarium, no. 1,463,907, collected in dense forest at Balsapuerto (lower Huallaga basin), Department of Loreto, Peru, altitude 150 to 350 meters, August 29, 1929, by E. P. Killip and A. C. Smith (no. 28471). Duplicates at F and Y. Other collections from this locality are *Killip & Smith* 28429 (F, N, Y), 28467 (F, N, Y). The description of the staminate inflorescence is based on *Klug* 2870, from the same locality.

DISTRIBUTION: Amazonian Peru, at low elevations.

PERU: LORETO: Santa Rosa below Yurimaguas, *Killip & Smith* 28993 (N, Y). Pongo de Manseriche, *Dennis* (*Killip & Smith* 29145, N, Y); *Tessmann* 4603 (B), 4667 (B); *Mexia* 6355 (N), 6360 (N). Mouth of Río Pastaza, *Dennis* (*Killip & Smith* 29196, N, Y).

In no other South American species is the difference between the leaves at a node so great. In this respect *P. bassleriana* resembles *P. ecbolophylla* and *P. donnell-smithiana* of Central America. Both of these have well-developed petioles and differ also in cystolithic marking and other details.

It is a pleasure to name this species for Dr. Harvey M. Bassler, the distinguished geologist, our host at Iquitos, who has done much to encourage general scientific work in the Peruvian montaña.

30. Pilea daguensis Killip.

Pilea dendrophila major Wedd. in DC. Prodr. 16 [1]: 122. 1869.

DISTRIBUTION: Western Colombia, at low elevations.

COLOMBIA: Without definite locality, but perhaps type material, *Triana* 889 (B, BM, K, N, Par). EL CHOCÓ: Tutunendo, Archer 2129 (N), 2172 (N). EL VALLE: "Province of Buenaventura, 300 meters", *Triana* (BM, type, also type of *P. dendrophila major*). Santa Rosa, Río Dagua, *Killip* 11550 (B, G, N, Ph, Y).

Described as a variety of *P. dendrophila* Miq. (=*P. imparifolia* Wedd.), this plant certainly merits specific rank. Because of the inappropriateness of Weddell's varietal name for the species, I am proposing a substitute.

34. Pilea seemannii Killip.

Pilea variegata Wedd. in DC. Prodr. 16 [1]: 123. 1869. Not *P. variegata* Seem. 1854, a transfer of *Urtica variegata* Spreng.

DISTRIBUTION: Western Colombia, at low elevations.

COLOMBIA: Locality not definitely established, *Triana* (B, BM, K, N, Par, type of *P. variegata* Wedd.). Cape Corrientes, *Seemann* (BM, cited as *P. variegata* Seem.). EL VALLE: Córdoba, *Killip* 5117 (G, N, Ph, Y).

Seemann transferred *Urtica variegata* Spreng. to *Pilea*, but wrongly associated his specimen from Cape Corrientes with Sprengel's West Indian plant. *Urtica variegata* and, therefore, *Pilea variegata* are doubtless conspecific with *P. sessiliflora* Sw., as treated by Weddell.

The type material collected by Triana is variously labeled in different herbaria, the localities being given as "El Chocó", "Forêts de Barbacoas", "Prov. de Barbacoas i Chocó", and "Prov. Chocó et Barbacoas", the last being used by Weddell at the place of publication. Sometimes the number "888" is associated with this collection.

35. Pilea costata Killip, sp. nov.

Dioica, glaberrima, foliis trinervis subtus punctatis ad basim crenato-serratis dissimilibus, majore lanceolato-elliptico acuminato basi cuneato, minore ovato

obtuso vel acutiusculo, cystolithis linearibus dense ornatis, cymis ♀ sessilibus vel breviter pedunculatis, segmentis perigonii inaequalibus, achaeniis late ovatis laevibus costatis.

Succulent herb, the stem repent, at length erect, about 50 cm high, branched toward apex, the branches suberect; plant glabrous throughout; stipules less than 1 mm long, soon deciduous; leaves of a node unequal and dissimilar, crenate-serrate nearly to base (serrations mucronulate), trinerved, densely covered on both surfaces with fine linear cystoliths, dark green above, paler and black-punctate beneath, the larger leaf lance-elliptic, 2.5 to 3.5 cm long, 1.2 to 1.5 cm wide, acuminate at apex, cuneate at base, the petiole 1 to 1.5 cm long, the smaller leaf ovate, 1.5 to 2 cm long, obtuse or subacute at apex, subrotund at base, the petiole up to 5 mm long; plants dioecious; staminate flowers not seen; pistillate flowers in sessile or short (up to 5 mm)-peduncled cymes 3 to 4 mm wide, the segments unequal, the larger 1 mm long, the others half as long; achenes broadly ovate, 1 to 1.2 mm long, 1 mm wide, longitudinally costate at center of either face, smooth.

Type in the U. S. National Herbarium, no. 1,463,889, collected in dense forest along the Pichis Trail, near Eneñas, Department of Junín, Peru, altitude 1,700 meters, July 1, 1929, by E. P. Killip and A. C. Smith (no. 25638).

The achenes are unusually large for species of this immediate relationship and are conspicuously costate.

36. Pilea pichisana Killip, sp. nov.

Herba dioica glaberrima subrepens, ramis laxis, stipulis triangularibus deciduis, foliis inaequimagnis sed similibus ovato-lanceolatis acutis vel acuminatis basi rotundatis vel subacutis fere ad basim cuspidulato-crenato-serratis trinerviis, cystolithis punctiformibus, cymis ♀ parvis subsessilibus, achaeniis anguste ovatis.

Subrepent herb, the branches lax, 10 to 20 cm long; plant glabrous throughout; stipules triangular, less than 1 mm long, soon deciduous; leaves of a node unequal but similar, ovate-lanceolate, acute or acuminate at apex, rounded or subacute at base, crenate-serrate nearly to base (serrations cuspidulate), trinerved, the cystoliths all punctiform, the larger leaf 2 to 2.8 cm long, 1 to 1.3 cm wide, the petiole 0.6 to 1.5 cm long, the smaller leaf 0.5 to 1.2 cm long, 0.3 to 0.7 cm wide, the petiole up to 2 mm long; plants dioecious; staminate flowers not seen; pistillate flowers in subsessile cymes about 4 mm wide, the segments unequal, one about twice as long as the others; achenes narrowly ovate, about 0.8 mm long, 0.5 mm wide.

Type in the U. S. National Herbarium, no. 1,463,895, collected in dense forest along the Pichis Trail, near Dos de Mayo, Department of Junín, Peru, altitude 1,800 meters, July 3, 1921, by E. P. Killip and A. C. Smith (no. 25876). Duplicates at F and Y.

The cystolithic marking is quite unlike that of close relatives of *P. pichisana*. The plant has a general resemblance to *P. delicatula*, which belongs to the group with similar and equal leaves, but that has conspicuous persistent stipules and different cystoliths.

37. Pilea rojasiana Killip, sp. nov.

Herba scandens dioica glaberrima, ramis multis brevibus, stipulis parvis suborbiculatis deciduis, foliis crassis obtusis basi abrupte attenuatis supra medium 4–5-crenulatis petiolatis triplinerviis, cystolithis paginae superioris linearibus transversis conspicuis paginae inferioris punctiformibus, laminis in eodem jugo inaequimagnis et dissimilibus, majore rhombica brevipetiolata, minore ovato-

orbiculata, subsessili, cymis ♂ laxis 8-floris brevipedunculatis, perigonio globoso dentibus minutis.

Climbing herb, woody at base, glabrous throughout; stem several-branched, the branches up to 10 cm long, leafy; stipules minute, suborbicular, about 1 mm long, soon deciduous; leaves thick, obtuse, abruptly narrowed at base, 4 to 5-crenulate in upper half, petiolate, triplinerved, the cystoliths of upper surface linear, conspicuous, transverse across blade, those of the under surface punctiform, inconspicuous; leaves of a pair unequal and dissimilar, the larger rhombic, 7 to 20 mm long, 5 to 15 mm wide, the petioles 2 to 4 mm long, the smaller leaves ovate-orbicular, 5 to 8 mm long, subsessile; plants dioecious; staminate flowers borne in loose, about 8-flowered cymes, the peduncles up to 5 mm long, the perianth globose, about 1.5 mm in diameter, green distally, yellowish proximally, the segments at length spreading, the tip minute, barely 0.4 mm long.

Type in the U. S. National Herbarium, no. 1,140,090, collected at San José, near San Antonio, Western Cordillera, west of Popayán, Department of El Cauca, Colombia, altitude 2,400 to 2,700 meters, June 28, 1922, by F. W. Pennell and E. P. Killip (no. 7373).

DISTRIBUTION: Southwestern Colombia.

COLOMBIA: Without definite locality, *Triana* 492 (Par). EL CAUCA: Micay Valley, *Killip* 7678 (G, N, Ph).

Weddell referred the Triana specimen to *P. nutans*, a species which *P. rojasiana* resembles in general appearance. The leaves of the proposed species, however, are strictly in pairs, not pseudoverticillate, and the cystoliths of their lower surface are punctiform, not linear as in *P. nutans*.

This species is named for Señor Nicolás Rojas, former governor of the Department of El Cauca, whose many courtesies to the Pennell-Killip expedition are greatly appreciated.

39. Pilea haenkei Killip, sp. nov.

Herba dioica glaberrima, stipulis minutis deciduis, foliis similibus sed valde inaequimagnis, ovato-lanceolatis cordulatis crenato-serrulatis, cystolithis supra fusiformibus et punctiformibus, cymis ♂ sessilibus vel brevipedunculatis.

Plant herbaceous, 25 cm high or more, glabrous throughout; stipules broadly ovate-triangular, 1 mm long, soon deciduous; leaves of a node similar but very unequal, ovate-lanceolate, acuminate at apex, cordulate at base, crenate-serrate to base, triplinerved (lateral nerves extending to base of tip of blade), membranous, dark green on both surfaces, densely covered with fusiform and punctiform cystoliths above and fusiform ones beneath, the larger leaves 9 to 13 cm long, 3.5 to 4.5 cm wide, their petioles about 1.5 cm long, the smaller leaves 1.5 to 2 cm long, 7 to 8 mm wide, subsessile; plants dioecious; staminate cymes sessile or short (about 4 mm)-peduncled, the perianth globose in bud, about 1 mm in diameter, the lobes minutely tipped; pistillate inflorescence unknown.

Type in the Národní Museum, Prague, collected in the montaña of Peru in 1790 by Thaddeus Haenke (no. 1870).

Because of the extreme difference in the size of the leaves at a node, this species most resembles *P. bassleriana* but the symmetrical smaller leaves and the toothing and shape of the larger leaves readily distinguish it.

40. Pilea macrocystolithica Killip, sp. nov.

Herba dioica (?) glaberrima, stipulis deciduis, foliis dissimilibus et inaequimagnis, cuiusque jugi majore ovato vel ovato-lanceolato, apice obtuso vel obtuse acuminato basi rotundato, minore suborbiculato, subsessili, cystolithis supra magnis filiformibus et fusiformibus, cymis ♂ pedunculatis, pedunculis tenuibus.

Plant herbaceous, glabrous throughout, the stem simple, densely covered with longitudinal linear cystoliths; stipules triangular-ovate, about 1.5 mm long, obtuse, deciduous; leaves of a node dissimilar and unequal, the larger ovate or ovate-lanceolate, 4 to 6 cm long, 2 to 3 cm wide, obtuse or obtusely acuminate at apex, rounded at base, short (3–8 mm)-petiolate, serrulate nearly to base (serrulations with filiform tips), the smaller leaves suborbicular, 1.5 to 2 cm wide, subsessile, the blades membranous, the cystoliths of the upper surface smaller and obscure; plants apparently dioecious; staminate cymes subglobose, the peduncles about 2 cm long, very slender, the flowers undeveloped.

Type in the Národní Museum, Prague, collected in the montaña of Peru in 1790 by Thaddeus Haenke (no. 1860).

From its near relatives this is separated by the large cystoliths on the upper surface of the leaves and by the filiform-tipped teeth of the leaves.

41. Pilea hydrocotyliflora Killip, sp. nov.

Herba tenuis monoica glaberrima, stipulis minutis mox deciduis, foliis inaequimagnis sed similibus, oblongo-lanceolatis vel lanceolatis longe acuminatis basi subrotundatis fere ad basim serrulatis papyraceis triplinerviis, nervis lateralibus apicem limbi fere attingentibus, cystolithis minutis linearibus, inflorescentiis unisexualibus, ♂ in axillis superioribus umbelliformibus in pedunculis elongatis filiformibus, floribus longipedicellatis, perigonio subgloboso, floribus ♀ in cymis paucifloris in axillis mediis, segmentis ovatis, achaeniis late ovatis.

Slender herb, 60 to 90 cm high, glabrous throughout, the stem simple; stipules minute, suborbicular, about 0.7 mm long, soon deciduous; leaves oblong-lanceolate or lanceolate, long-acuminate at apex, subrotund at base, serrulate nearly to base, triplinerved (lateral nerves arising near base and extending almost to apex), membranous, bearing minute linear cystoliths on both surfaces, the leaves of a node similar but unequal, the larger 4 to 8 cm long, 1.5 to 2.5 cm wide, the smaller 1 to 2 cm long, 0.5 to 1 cm wide; plants monoecious; staminate inflorescences borne in the upper axils, umbelliform with filiform peduncles 3 to 4 cm long, the flowers with pedicels 5 to 6 mm long when developed, the perianth subglobose, 1 to 1.2 mm wide, the lobes obtuse; pistillate flowers in few-flowered cymes up to 1 cm long (including a slender peduncle), borne in middle axils, the perianth segments ovate, unequal, the largest about 0.6 mm long, the achenes broadly ovate, 1 mm long, 0.8 mm wide.

Type in the herbarium of the Botanisches Museum, Berlin, collected near Ocaña, Department of Norte de Santander, Colombia, altitude 1,800 meters, August 22, 1878, by W. Kalbreyer (no. 691). Duplicate at K.

This species apparently is most closely related to the Costa Rican *P. augustifolia*, having an umbellate inflorescence with very slender peduncles. In that, however, the flowers are more compact and are short-pediceled and the leaves very narrowly lanceolate, those of a node being subequal.

42. Pilea macrantha Killip, sp. nov.

Herba dioica glaberrima, foliis grosse serratis basi rotundatis triplinerviis, nervis lateralibus apicem limbi fere attingentibus, laminis in eodem jugo valde inaequimagnis et parum dissimilibus, majore lanceolata vel ovato-lanceolata caudato-acuminata subobliqua breviter petiolata, minore ovato-lanceolata subsessili, inflorescentia ♂ laxe paniculata in axillis superioribus, floribus in glomerulis densis, perigonio globoso vel depresso-globoso, lobis lineari-subulatis cystolithis obscuris linearibus ornatis.

Plant herbaceous, glabrous throughout, the stem apparently erect, few-branched, 35 cm high or more; stipules soon deciduous; leaves coarsely serrate

nearly to base, subrotund at base, membranous, bearing minute faint linear and few punctiform cystoliths on both surfaces, triplinerved, the lateral nerves reaching to the base of the acumen, the leaves of a node very unequal and slightly dissimilar, the larger lanceolate or ovate-lanceolate, 4 to 10 cm long, 2 to 3 cm wide, caudate-acuminate at apex, suboblique, the petioles up to 5 mm long, the smaller leaves ovate-lanceolate, 2 to 3 cm long, 1.2 to 1.5 cm wide, acuminate at apex, subsessile; plants dioecious; staminate inflorescence loosely paniculate, borne in upper axils, 4 to 7 cm long, the flowers in dense glomerules, sessile or short-pediceled, the perianth globose or depressed-globose, 1.5 to 2 mm long (exclusive of lobes), 2 mm wide, faintly marked with linear cystoliths, the lobes linear-subulate, 1 to 2 mm long; pistillate inflorescence unknown.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected on Alto del Tabano, Cordillera de Pasto, Department of Nariño, Colombia, May 4, 1876, by E. André (no. K1670, in part).

From species of this immediate relationship *P. macrantha* is at once separated by the large staminate flowers. The leaves and flowers are suggestive of *P. fallax*, but the proposed species is readily differentiated by the nervation of the leaves, cystolithic marking, and large inflorescence.

43. Pilea tetrapoda Killip, sp. nov.

Dioica, glaberrima, stipulis minutis mox deciduis, foliis leviter serrulatis cystolithis inconspicuis linearibus, laminis in eodem jugo valde inaequimagnis et parum dissimilibus, majore elliptico-ovata vel elliptico-lanceolata acuminata infra medium in basim subobliquum subauriculatum attenuata, minore ovata vel orbculato-ovata acuta basi rotundata, cymis ♀ 4–7-floris nunc in axillis mediis sessilibus nunc in axillis inferioribus pedunculatis, segmentis perigonii disparibus, achaeniis orbiculatis laevibus.

Plant 25 cm long, or more (basal portion not seen), glabrous throughout; stem somewhat succulent; stipules minute, orbicular, about 1 mm long, soon deciduous; leaves shallowly serrulate, except in lower third, triplinerved (nerves slightly elevated on upper surface, the lateral arising about 2 mm above base, extending to upper third of blade), membranous, dark green above, paler beneath, bearing numerous faint linear cystoliths above, and a few thicker, scarcely discernible cystoliths below; leaves of a pair very unequal and somewhat dissimilar, the larger elliptic-ovate or elliptic-lanceolate, 3 to 5 cm long, 1.3 to 2 cm wide, acuminate, narrowing in lower third to a slightly oblique, subauricular base, the smaller leaf ovate or orbicular-ovate, 1.5 to 2 cm long, 1 to 1.3 cm wide, acute at apex, rounded at base; plants dioecious; pistillate flowers densely or loosely clustered in 4- to 7-flowered cymes up to 5 mm wide, the cymes (4 at a node) sessile in the axils of the middle leaves or borne on slender peduncles (3 to 10 mm long) in axils of the lower leaves; perianth segments unequal, the lateral half as long as the middle segment; achenes orbicular, about 1.2 mm wide, smooth.

Type in the U. S. National Herbarium, no. 1,197,652, collected at Palmera, Río Pastaza, between Baños and Mera, Province of Tungurahua, Ecuador, altitude 1,200 meters, in 1924, by G. H. H. Tate (no. 665).

There are two staminate specimens in the Kew Herbarium, *André* 1671 and a specimen mounted with *P. macrantha* under *André* 1670, both of which from the foliage I believe represent *P. tetrapoda*. Pending the collection of more material of this species, it seems best not to include a description of the staminate inflorescence in the formal diagnosis of *P. tetrapoda*, but this may here be described as follows:

Staminate inflorescence cymose-paniculate, up to 7 cm long including peduncle, the flowers in compact clusters, the perianth globose, about 1 mm wide, the lobes ovate, obtuse.

COLOMBIA: NARIÑO: Alto del Tabano, Cordillera de Pasto, *André* K1670, in part (K). Tamba Savanilla, *André* K1671 (K).

55. Pilea leptophylla Killip.

Pilea dauciodora crenata Wedd. in DC. Prodr. 16[1]: 139. 1869.

Pilea dauciodora pilosula Wedd. in DC. Prodr. 16[1]: 139. 1869.

DISTRIBUTION: Northern Venezuela and northeastern Colombia, up to 1,000 meters altitude.

VENEZUELA: Without definite locality, *Gollmer* (B). ARAGUA: Colonia Tovar, *Fendler* 1247 (G, Gen, K, type, also type of *P. dauciodora crenata*, N, Ph); *Moritz* 790 (B, type of *P. dauciodora pilosula*, BM).

COLOMBIA: MAGDALENA: Santa Marta Mountains, *H. H. Smith* 1223 (B, BM, F, G, N, Ph, Y).

58. Pilea discolor Killip, sp. nov.

Dioica, glaberrima, caule erecto, stipulis ovatis mox deciduis, foliis in eodem jugo subaequalibus similibusque late ovatis vel ovato-lanceolatis rotundatis vel obtuse acuminatis basi subauriculatis crenato-serratis petiolatis triplinerviis nervis lateralibus medium paginae attingentibus, cystolithis in paginis ambis rectis vel curvatis linearibus vel fusiformibus, cymis ♂ solitariis in axillis superioribus 6–10-floris, pedunculo filiformi, floribus brevipedicellatis, perigonio subgloboso lobis productis, cymis ♀ paucifloris subsessilibus petiolo brevioribus, segmentis perigonii subaequalibus, achaeniis minimis.

Plant perennial, glabrous throughout; stem erect, 30 cm high or more, succulent, branched, the lower internodes up to 8 cm long, with soon deciduous leaves, the upper much shorter, the leaves persistent; stipules ovate, 2 to 4 cm long, obtuse, soon deciduous; leaves of a node subequal and similar, broadly ovate to ovate-lanceolate, 1.2 to 3 cm long, 1 to 2 cm wide, rounded or obtusely acuminate at apex, subauricular at base, crenate-serrate, entire at base, triplinerved (lateral nerves extending barely to middle of blade), petiolate (petioles very slender, 0.5 to 1 cm long), dark green above, much paler beneath, the cystoliths straight or curved, linear or fusiform, conspicuous above, often fainter beneath; plants dioecious; staminate flowers borne in the upper axils, in solitary, 6 to 10-flowered clusters up to 5 mm wide on slender peduncles 7 to 10 mm long, sessile or short-pediceled, the perianth subglobose, 1.5 mm wide, the lobes produced, about 1 mm long; pistillate flowers in few-flowered sessile cymes, shorter than the petioles, the perianth segments subequal; achenes less than 1 mm long.

Type of pistillate plant in the U. S. National Herbarium, no. 1,123,224, collected at Chinquinquirá, Department of Cundinamarca, Colombia, altitude 2,500 meters (Eastern Cordillera), July 1909, by Brother Ariste Joseph (no. A890); duplicate at Instituto de la Salle, Bogotá. Type of staminate plant in herbarium of the Royal Botanic Gardens, Kew, collected in Colombia by F. C. Lehmann (no. BT1258), the precise locality not given; duplicate at F.

The foliage of this species, especially as shown in the Lehmann specimen, is suggestive of *P. dauciodora*, but the inflorescence, both staminate and pistillate, is quite dissimilar. It is, moreover, a tall coarse plant and apparently is referable to the small section with solitary staminate heads.

62. Pilea tungurahuae Killip, sp. nov.

Dioica, glaberrima, caule erecto-simplici, stipulis ovatis subpersistentibus, foliis ovatis acuminatis basi rotundatis vel subcuneatis grosse serratis tripli-

nerviis vel subquintuplinerviis nervis lateralibus ad trientem superiorem limbi productis, cystolithis in pagina superiore fusiformibus subtus punctiformibus, floribus ♂ sessilibus in glomerulos densos paniculam pauciramosam in axillis superioribus efficientes aggregatis, ♀ in cymis parvis sessilibus vel subsessilibus in axillis mediis et inferioribus, segmentis pergonii disparibus, achaeniis orbiculatis minimis.

Plant herbaceous, glabrous throughout, the stem slender, erect, 25 cm high or more, apparently simple; stipules ovate, 10 mm long, 5 mm wide, subpersistent; petioles up to 2 cm long, those of a node often unequal; leaves of a node similar and nearly equal, ovate, 5 to 6 cm long, 3 to 3.5 cm wide, acuminate at apex, rounded or subcuneate at base, coarsely serrate nearly to base, triplinerved or subquintuplinerved (primary lateral nerves arising close to base and extending to upper third of blade), membranous, bearing conspicuous fusiform cystoliths above and punctiform cystoliths beneath, dark green above, paler and sparingly black-punctate beneath; plants dioecious; staminate flowers sessile in small dense clusters in a few-branched panicle borne in the upper axils, the peduncles about 3 cm long, the segments linear; pistillate flowers in small, sessile or subsessile cymes about 5 mm wide, borne in the middle and lower axils, the segments unequal, the larger about 0.4 mm long; achenes orbicular, 0.5 mm long.

Type in the U. S. National Herbarium, no. 1,197,577, collected at San Antonio, on the eastern slope of Tungurahua Volcano, Province of Tungurahua, Ecuador, altitude 2,000 meters, in 1924, by G. H. H. Tate (no. 585).

69. Pilea smithii Killip, sp. nov.

Herba dioica glaberrima, caule basi lignescente, erecto vel adscendente, stipulis ovato-lanceolatis deciduis, petiolis tenuissimis longis plerumque inaequalibus, laminis ovato-lanceolatis vel triangulari-lanceolatis caudato-acuminatis basi subcordatis grosse dentatis trinerviis, cystolithis supra linearibus, inflorescentiis ♀ cymoso-paniculatis petiolo brevioribus tenuiter pedunculatis, floribus pedicellatis, segmentis perigonii linearibus, achaeniis ovatis.

Plant herbaceous, glabrous throughout, the rootstock subligneous, with numerous fibrose rootlets; stem erect or ascending, up to 45 cm high, succulent; stipules ovate-lanceolate, 1 to 2 mm long, obtuse, deciduous; petioles very slender, those of a pair usually unequal, the longer up to 5 cm long, the shorter up to 2.5 cm long; leaves of a pair similar and subequal, ovate-lanceolate or triangular-lanceolate, 1 to 6 cm long, 1 to 3 cm wide, caudate-acuminate at apex, cordulate at base, coarsely dentate to base (teeth about 15 to a side), 3-nerved, reticulate-veined, concolorous, sparingly punctate, thin-membranous, faintly marked with linear cystoliths above; plants dioecious; pistillate inflorescence cymose-paniculate, shorter than the adjacent petiole, slender-peduncled (peduncle up to 1 cm long), the flowers pedicellate, the pedicels about 1 mm long, persistent; perianth segments linear, the middle segment about 0.7 mm long, the lateral segments half as long; achenes ovate, 1 mm long.

Type in the U. S. National Herbarium, no. 1,356,171, collected on wooded banks of the Río de la Baja, below La Baja, Department of Santander, Colombia (altitude 2,200 to 2,300 meters), January 26, 1927, by E. P. Killip and A. C. Smith (no. 18284). Duplicates at G and Y.

DISTRIBUTION: Eastern Cordillera of Colombia, at 2,200 to 3,200 meters altitude. Known only from the general vicinity of Bucaramanga.

COLOMBIA: SANTANDER: La Baja, *Killip & Smith* 17188 (G, N, Y), 18797 (G, N, Y). California, *Killip & Smith* 16990 (G, N).

This is a much slenderer plant than any of its near relatives, and the leaves are distinctly cordulate at base and coarsely dentate. In habit it suggests *P. hyalina*, but the cordulate leaves, diffuse inflorescences, and much larger fruit at once distinguish it.

71. Pilea triradiata Killip, sp. nov.

Frutex dioicus glaberrimus, stipulis oblanceolatis mox deciduis cystolithis elongatis filiformibus obsitis, foliis ellipticis vel elliptico-oblanceolatis obtusiusculis basi cuneatis crenato-serratis trinerviis, cystolithis utrinque densissimis triradiatis, floribus ♂ subsessilibus in glomerulos parvos paniculam valde ramosam petiolo longiorem efficientes aggregatis, perigonio globoso-obovoideo, segmentis ovatis.

Shrub, glabrous throughout, the stem sulcate when dried, densely covered with faint short linear cystoliths; stipules oblanceolate, 1.5 cm long, 3.5 mm wide, caducous, bearing elongate filiform cystoliths; petioles 5 to 13 mm long, stout, those of a node subequal; leaves of a node similar and equal, elliptic or elliptic-oblanceolate, 6 to 15 cm long, 2 to 4 cm wide, sometimes suboblique, subobtuse at apex, cuneate at base, crenate-serrate to below middle (serrations 4 per cm) 3-nerved (lateral nerves extending to apex of blade), dark green above, silvery beneath, the cystoliths very dense on both surfaces, stellate, 3-rayed; plants dioecious; staminate flowers subsessile, in small dense clusters forming much-branched panicles up to 4 cm long and borne in twos in the axils of the upper leaves, the peduncles slender, the perianth globose-obovoid in bud, up to 1 mm long, the segments ovate, obtuse; pistillate flowers unknown.

Type in the herbarium of the Botanisches Museum, Berlin, collected near Caracas, Venezuela, May 10, 1856, by J. Gollmer.

This species has the unusual stellate cystolithic marking on the leaves similar to that of *P. marginata* and *P. crugeriana*, the cystoliths, however, being far more abundant and coarser than in the other two species.

74. Pilea antioquensis Killip, sp. nov.

Herba erecta monoica glaberrima, foliis ovatis vel ovato-lanceolatis attenuato-acuminatis basi subauriculatis crenato-serratis triplinerviis utrinque cystolithis linearibus vel fusiformibus dense obsitis, cymis unisexualibus ambis similibus subsessilibus, ♂ in axillis inferioribus, segmentis perigonii mucronulatis, ♀ in axillis superioribus, achaeniis orbiculatis.

Plant erect, 30 cm high or more, glabrous throughout; stem sulcate, somewhat succulent; stipules soon deciduous; leaves of a pair similar and subequal, petiolate (petioles 3.5 to 5 cm long), ovate to ovate-lanceolate, 12 to 20 cm long, 7 to 10 cm wide, attenuate-acuminate at apex, narrowed and subauricular at base, crenate-serrate nearly to base, triplinerved (principal nerves extending to apex of blade, the secondary nerves divaricate at right angles to principal nerves, conspicuous), dark green above, paler beneath, densely covered on both faces with unequal, linear or slightly fusiform cystoliths; plants monecious, the heads unisexual, the staminate and pistillate similar, cymose, 1 to 2 cm long, subsessile, the staminate borne in the lower axils, the pistillate in the upper; segments of staminate flowers with a minute subulate tip less than 0.1 mm long; segments of pistillate flowers unequal, the largest about 0.7 mm long; achenes orbicular, 0.5 mm long.

Type in the herbarium of the New York Botanical Garden, collected at Angelopolis, Department of Antioquia, Colombia, January 22, 1928, by R. A. Toro (no. 885).

In *Pilea puracensis*, the nearest relative of the proposed species, the achenes are fully twice as large, the staminate inflorescence is more diffuse and is

borne *above* the pistillate, the leaves are proportionately narrower and are 3-nerved rather than triplinerved, and the cystolithic marking is much finer.

77. Pilea apiculata Killip, sp. nov.

Herba monoica (vel dioica?) glaberrima, stipulis parvis deciduis, foliis ovatis vel ovato-lanceolatis, apice caudato-acuminatis basi subauriculatis supra medium serrulatis trinerviis, subtus punctulatis, cystolithis fusiformibus, cymis unisexualibus, ♂ petiolos vix aequantibus aut illis brevioribus compactis demum subdiffusis petiolis longioribus, segmentis apiculatis, cymis ♀ sessilibus vel breviter pedunculatis, petiolis brevioribus, achaenis minutis ovatis.

Herb, up to 60 cm high, glabrous throughout; stipules ovate, about 0.7 mm long, soon deciduous; petioles 1 to 2.5 cm long; leaves ovate or ovate-lanceolate, 6 to 12 cm long, 2.5 to 4 cm wide, slightly oblique, caudate-acuminate at apex, subauriculate at base, sharply serrulate in upper half, 3-nerved (lateral nerves extending to apex of blade), dark green above, pale and obscurely black-punctate beneath, the cystoliths fusiform, curved, conspicuous on upper surface; plants monoecious (or sometimes dioecious?), the cymes unisexual; staminate cymes shorter than or subequal to the adjacent petioles, compact, at length somewhat diffuse and slightly exceeding the petioles, the flowers short-pediceled or subsessile in loose clusters, the perianth turbinate in bud, 1 to 1.2 mm in diameter, the segments linear, apiculate, the tip about 0.5 mm long; pistillate cymes sessile or short-peduncled, shorter than the adjacent petioles, the segments unequal, the middle segment 0.5 mm long, the lateral segments half as long; achenes minute, ovate, 0.4 to 0.5 mm long, smooth.

Type in the U. S. National Herbarium, no. 533,531, collected at Río Piedras, near Santa Marta, Department of Magdalena, Colombia, altitude 600 meters, in 1898 or 1899, by H. H. Smith (no. 1430). Duplicates at B, BM, F, G, Ph, Y. Another specimen of this species at the New York Botanical Garden bearing this same number was collected at "Cacagualito, 1,000 to 3,000 ft."

These specimens were distributed as "*P. riparia* Donn. Smith", a Guatemalan species not closely related.

78. Pilea subamplexicaulis Killip, sp. nov.

Dioica, glaberrima, stipulis triangulari-ovatis subpersistentibus, foliis lanceolatis vel oblongo-lanceolatis apice acuminatis vel attenuatis basi cordatis vel subamplexicaulibus sessilibus vel breviter petiolatis subtus glaucescentibus, cystolithis supra numerosis fusiformibus et paucis punctiformibus, inflorescentiis ♂ cymosis floribus pedicellatis laxe aggregatis, perigonio rhombeo-globoso, cymis ♀ sessilibus.

Plant glabrous throughout; stipules triangular-ovate, about 1.5 mm long, subpersistent; leaves of a node similar and equal, lanceolate or oblong-lanceolate, 7 to 20 cm long, 2.5 to 6 cm wide, acuminate or attenuate-acuminate at apex, cordate or somewhat clasping at base, sessile or short (up to 5 mm)-petioled, trinerved or subtriplinerved (nerves extending to apex), bronze-green above, glaucous beneath, the cystoliths of upper face numerous, ornate, fusiform, with a few punctiform ones intermingled, those of the lower surface less numerous and fainter; plants dioecious; staminate inflorescence cymose, up to 2 cm long, the flowers pedicellate, in loose clusters, the perianth rhomboid-globose, the lobes 1 to 2 mm long, obtuse; pistillate inflorescence cymose, the cymes sessile, up to 5 mm long.

Type in the Goeldi Museum, Pará, Brazil, collected on Cerro de Escaler, near Tarapoto, Department of San Martín, Peru, altitude 1,100 meters, November 1902, by E. Ule (no. 6588). Duplicates at B and K. The description of the pistillate inflorescence is derived from the following collection:

PERU: SAN MARTÍN: San Roque, alt. 1,400 meters, *L. Williams* 7425 (N).

80. Pilea attenuata Killip, sp. nov.

Dioica, glaberrima, caule erecto simplici basi repente, foliis anguste ellipticolanceolatis acuminatis basi cuneatis undulatis vel superne obscure crenulatis triplinerviis, cystolithis fusiformibus supra conspicuis, inflorescentiis ♀ cymoso-paniculatis, segmentis perigonii linearibus disparibus, achaeniis ovato-orbiculatis muriculatis margine crasso.

Plant glabrous throughout; stem repent at base, at length erect, simple 30 to 50 cm high; stipules linear-lanceolate, 5 mm long, 1.5 mm wide, soon deciduous, or subpersistent; petioles of a node equal or one slightly shorter than the other, 3 to 10 cm long; leaves of a node subequal and similar, narrowly elliptic-lanceolate, 9 to 15 cm long, 2 to 3.5 cm wide (extremes 25 cm long, 7 cm wide), acuminate at apex, cuneate at base, undulate or obscurely crenulate above middle, triplinerved (lateral nerves reaching nearly to acumen), the cystoliths fusiform, conspicuous above; plants dioecious; staminate inflorescence unknown; pistillate inflorescence cymose-paniculate, the peduncles slender, 3 to 4 cm long, the flowers subsessile, the perianth segments linear, unequal, the larger about 1.3 mm long, the smaller half as long; achenes ovate-orbicular, about 1.2 mm long, thickened at margin, muriculate.

Type in the herbarium of the Botanisches Museum, Berlin, collected near Pilatón, Province of Pichincha, Ecuador, in January 1889, by A. Sodiro (no. 153/24).

ECUADOR: PICHINCHA: San Nicolás, alt. 900 meters, *Sodiro* 153/29 (B).

The long narrow leaves and the muriculate achenes are the two marks by which this species may be readily recognized.

82. Pilea myriantha Killip.

Urtica floribunda H. B. K. Nov. Gen. & Sp. **2**: 38. 1817. Not *Pilea floribunda* Baker, 1897.

Pilea mutisiana Wedd. Ann. Sci. Nat. III. Bot. **18**: 218. 1852, in part.

Pilea multiflora Wedd. in DC. Prodr. 16[1]: 145. 1869, in part.

DISTRIBUTION: Southwestern Colombia and northern Ecuador, at 2,000 to 2,500 meters altitude.

COLOMBIA: EL CAUCA: Palacé, *Humboldt & Bonpland* (Par, type). Coconuco, *Killip* 6832 (N, Y).

ECUADOR: PICHINCHA: Mount Pichincha, *Sodiro* 153/27c (B).

84. Pilea losensis Killip, sp. nov.

Herba dioica glaberrima ad 3 m alt., stipulis parvis caducissimis, foliis similibus et subaequalibus, anguste ellipticis vel oblongo-ellipticis subobliquis apice acuminatis basi angustatis et cordulatis fere ad basim grosse crenato-serratis trinerviis, nerviis apicem attingentibus, cystolithis minutis linearibus et fusiformibus subtus obscuris, cymis ♀ petiolis brevioribus vel subaequalibus, achaeniis late ovatis.

Succulent herb up to 3 meters high, glabrous throughout; stipules narrowly ovate, up to 1 mm long, caducous; petioles 0.5 to 2 cm long, slender; leaves of a node similar and subequal, narrowly elliptic to oblong-elliptic, 6 to 12 cm long, 2 to 2.5 cm wide, acuminate at apex, narrowed and cordulate at base, coarsely crenate-serrate nearly to base, 3-nerved (lateral nerves extending to apex of blade), thin, dark green above, pale beneath, the cystoliths linear and fusiform and very small above, linear and longer beneath; plants dioecious; pistillate cymes subequal to or shorter than the adjacent petioles, divaricate, the peduncles slender, the perianth segments unequal, the largest about 1.2 mm long, the achenes broadly ovate, 1.5 to 1.8 mm long, slightly compressed.

Type in the U. S. National Herbarium, no. 1,355,424, collected at Loso, north of Toledo, Department of Norte de Santander, Colombia, 2,400 meters altitude (Eastern Cordillera), March 6, 1927, by E. P. Killip and A. C. Smith (no. 20370). Duplicates at G, Y.

COLOMBIA: NORTE DE SANTANDER: Between Pamplona and Toledo, *Killip & Smith* 19969 (G, N, Y).

This is distinguished from *P. goudotiana* in having smaller stipules, different foliar cystoliths, a more diffuse pistillate inflorescence, and larger achenes.

96. Pilea gallowayana Killip, sp. nov.

Herba dioica, caule basi repente erecto inferne glabro superne rufo-hirsuto, stipulis late ovato-lanceolatis subpersistentibus, petiolis rufo-hirsutis, laminis rhombeo-ovatis acutis basi rotundatis vel emarginatis inaequaliter et saepe dupliciter crenato-serratis triplinerviis vel quintuplinerviis (nervis lateralibus trientem superiorem limbi attingentibus) supra glaberrimis subtus praesertim in nervis pubescentibus, cystolithis fusiformibus et punctiformibus, cymis ♂ et ♀ similibus compactis petiolo multo longioribus, segmentis perigonii ♂ filiformibus, achaeniis late ovatis.

Plant herbaceous, the stem repent at base, at length erect, 20 to 35 cm high, leafy at summit, glabrous below, rufo-hirsute above, especially at nodes; stipules broadly ovate-lanceolate, 9 to 10 mm long, obtuse, subpersistent, glabrous, bearing a few fusiform cystoliths; petioles 0.5 to 2 mm long, rufo-hirsute; leaves rhombic-ovate, 3 to 9 cm long, 2 to 7 cm wide, acute at apex, rounded or emarginate at base, unequally and often doubly crenate-serrate, triplinerved or quintuplinerved (lateral nerves extending to upper third of blade), above glabrous and copiously covered with fusiform and punctiform cystoliths, beneath hirsute on the nerves, sparsely pilosulous elsewhere, bearing numerous punctiform and a few faint linear cystoliths; plants dioecious, the staminate and the pistillate inflorescences in compact cymes up to 1.5 cm wide, similar in shape, the peduncles slender, up to 2 cm long; staminate perianth 2 to 3 mm wide, the lobes filiform, 1.5 to 2 mm long, pilosulous; pistillate perianth with unequal segments, the middle 0.9 mm long, the lateral barely 0.3 mm long; achenes broadly ovate, about 1.2 mm long, 1 mm wide.

Type in the U. S. National Herbarium, no. 1,140,074, collected in dense forest above La Cumbre, Department of El Valle, Western Cordillera, Colombia, altitude 2,000 meters, May 21 to 25, 1922, by F. W. Pennell and E. P. Killip (no. 5878). Duplicates at G, Ph, Y.

DISTRIBUTION: Western Colombia, up to 2,100 meters altitude.

COLOMBIA: EL CHOCÓ: Between La Oveja and Quibdó, *Archer* 1701 (N). Headwaters of Río Tutunendo, east of Quibdó, *Archer* 2184 (N), 2189 (N). NARIÑO: Armada, *André* K1680 (K).

The leaves of *P. gallowayana* and *P. ptericlada* Donn. Smith, from Costa Rica, are very similar in shape and size. The cystoliths are different, however, and the Costa Rican plant is glabrous throughout. In general leaf shape this plant is similar also to *P. latifolia*. That species, however, is described by Schlim as a shrub, and all the specimens I have examined give every indication that the plant is suffrutescent. The petioles of *P. latifolia* are much longer, and the inflorescence is an elongate narrow panicle, not a cyme.

This species is named for Dr. J. F. Galloway, physician-in-charge of the Smith Clinic, La Cumbre, at the time it served as our headquarters.

109. Pilea glaucophylla Killip, sp. nov.

Herba elata erecta, caule simplici sparse hirsutulo, stipulis ovatis parvis mox deciduis, petiolis inaequalibus, laminis oblongis vel oblongo-lanceolatis acutis basi rotundatis vel subcuneatis crebre crenato-serratis triplinerviis supra glaber-

rimis viridibusque infra in nervis pilosulis et glaucescentibus, cystolithis numerosissimis linearibus et fusiformibus, paucis punctiformibus adspersis, inflorescentiis unisexualibus similibus cymoso-paniculatis, petiolo suo brevioribus, inflorescentiis ♂ in axillis inferioribus, ♀ in axillis omnibus, floribus sessilibus, perigonio ♂ depresso-globoso lobis ovatis, achaeniis minutis.

Plant erect, 50 cm high or more, the stem simple, sparingly and finely appressed-hirsutulous; stipules ovate, about 5 mm long, 2 mm wide, soon deciduous; petioles of a node unequal, the longer 2 to 6 cm long, the shorter 1 to 2 cm long; leaves oblong or oblong-lanceolate, 10 to 15 cm long, 3 to 5 cm wide, subequal at a node, acute at apex, rounded or subcuneate at base, closely crenate-serrate to base, triplinerved (lateral nerves arising about 5 mm above base, extending to apex, and situated about a third of the way between margin and midnerve), glabrous and dark green above, finely pilosulous on the nerves and strongly glaucous beneath, the cystoliths very numerous, linear and fusiform, with a few punctiform ones intermingled; plants monoecious, the inflorescences unisexual, similar, cymose-paniculate, shorter than the adjacent petioles, the pistillate borne in all the axils, the staminate borne in the lower axils, sometimes in the same axil with the pistillate; staminate flowers sessile, the perianth depressed-globose in bud, up to 1 mm wide, the lobes ovate, obtuse; pistillate flowers sessile, the segments unequal; achenes minute, about 0.6 mm long.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected along the Quebrada Honda, Department of Tolima, Colombia, October 19, 1876, by *E. André* (no. K1669).

COLOMBIA: TOLIMA: Tambo de Savanilla, *André* K1668 (K).

110. Pilea salentana Killip, sp. nov.

Herba monoica basi repens, caulibus erectis, inferne glabrescentibus superne pilosulis, foliis oblongo-ovatis vel late ovatis acutis basi rotundatis vel subacutis grosse serratis trinerviis rugulosis supra sparse pilosulis infra in nervis pilosulis, cystolithis linearibus vel fusiformibus inconspicuis, inflorescentiis unisexualibus, ♂ in axillis superioribus, floribus pedicellatis, segmentis perigonii mucronulatis, ♀ in axillis mediis, petiolo suo brevioribus, segmentis perigonii dispariibus, achaeniis ovato-orbiculatis.

Plant herbaceous, repent at base, the stems erect, 30 cm high or more, succulent, glabrescent below, pilosulous above; stipules triangular, 1 to 3 mm long, soon deciduous; petioles 5 to 15 mm long, pilosulous, those of a node unequal; leaves of a node similar but sometimes slightly unequal, oblong-ovate to broadly ovate, 4 to 9 cm long, 2 to 8 cm wide, acute at apex, rounded or subacute at base, coarsely serrate, 3-nerved (lateral nerves about midway between midnerve and margin, extending nearly to apex of blade, the nerves and veins impressed above), dark green, somewhat rugulose, sparsely pilosulous above, paler and pilosulous on nerves and veins beneath, the cystoliths linear or fusiform, inconspicuous; plants monoecious, the inflorescence unisexual; staminate inflorescence loosely cymose, 2.5 to 3 cm long, much-branched, borne in upper axils, the flowers pedicellate, in 3- to 10-flowered clusters, the perianth about 1.5 mm long, the lobes with minute filiform tips; pistillate inflorescence cymose, borne in middle axils, few-branched, the peduncles slender, 5 to 7 mm long, shorter than the adjacent petioles, the perianth segments unequal, the middle 1 to 1.2 mm long, the lateral about a third as long; achenes ovate-orbicular, nearly 2 mm long, deep orange.

Type in the U. S. National Herbarium, no. 1,140,911, collected in clearing at Pinares, above Salento, Department of Caldas, Colombia, altitude 2,700 to 2,900 meters (Central Cordillera), August 2 to 10, 1922, by F. W. Pennell (no. 9354). Duplicate at G.

COLOMBIA: CALDAS: Magaña, Old Quindío Trail, alt. 3,200 to 3,300 meters, *Killip & Hazen* 9447 (N, Ph). Páramo, Quindío Trail, *Holton*, in 1853 (Y). TOLIMA: Between Ibagué and Mount Tolima, *Cuatrecasas* 2588 (Ma), 2590 (Ma).

111. Pilea castronis Killip, sp. nov.

Herba dioica basi repens, caulibus erectis inferne glaberrimis superne rufo-pilosulis, petiolis rufo-pilosulis, laminis oblanceolatis vel elliptico-lanceolatis caudatis basi rotundatis supra glaberrimis infra in nervis rufo-pilosulis, cystolithis numerosis fusiformibus et punctiformibus, cymis ♀ subsessilibus vel breviter pedunculatis petiolis brevioribus, segmentis perigonii linearibus subaequalibus, achaeniis late ovatis.

Plant herbaceous, repent at base, the stem erect, up to 60 cm high, simple or few-branched, succulent, glabrous below, rufo-pilosulous above; stipules lanceolate, 1.5 to 2.5 mm long, deciduous; petioles of a node subequal or one about half as long as the other, 0.5 to 3 cm long, rufo-pilosulous; leaves of a node similar and subequal, oblanceolate or elliptic-lanceolate, 6 to 14 cm long, 2 to 5 cm wide, caudate-acuminate at apex, rounded at base, serrulate or crenate-serrulate nearly to base, 3-nerved (lateral nerves about midway between midnerve and margin, extending to base of acumen; secondary nerves numerous, at right angles to primary nerves), dark green and glabrous above, paler and rufo-pilosulous on the nerves beneath, the cystoliths numerous, both fusiform and punctiform; plants dioecious; pistillate flowers in subsessile or short-peduncled cymes, shorter than the petioles, the perianth segments linear, subequal, about 1.3 mm long; achenes broadly ovate, 1.5 mm long.

Type in the U. S. National Herbarium, no. 1,356,150, collected in dense woods along stream, vicinity of Las Vegas, Department of Santander, Colombia (Eastern Cordillera, altitude 2,600 meters), December 23, 1926, by E. P. Killip and A. C. Smith (no. 16019). *Killip and Smith* 15949 and 16126, from the same locality, also belong to this species.

This species is similar to *P. salentana*, but the leaves are oblanceolate and less deeply toothed, and bear numerous punctiform cystoliths. The plants, moreover, appear to be dioecious. It is named in honor of Ramón Castro, an eminent citizen of Bucaramanga, who was a most cordial host to the collectors.

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A REVISION OF BESLERIA

By C. V. MORTON

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II

PREFACE

The present paper, by C. V. Morton, aide in the National Herbarium, is a critical account of the species of *Besleria*, of the family Gesneriaceae. This genus is confined to the New World Tropics, ranging from southern Mexico to Bolivia and Brazil. One hundred and forty-one species are recognized, of which 43 are here first described. Included also are descriptions of 11 new varieties and 5 new forms. The relatively large number of novelties is owing partly to the slight attention that has been given to the genus since the appearance of Professor Hanstein's monograph in 1865, and partly to the abundance of recent material now available for study, the present treatment being based upon specimens in the leading herbaria of the United States and in several of the larger botanical institutions of Europe. Types or isotypes of nearly all previously described species have been examined.

WILLIAM R. MAXON,
Curator, United States National Herbarium.

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A REVISION OF BESLERIA

By C. V. Morton

INTRODUCTION

Nearly ten years ago it came to the attention of the writer that the tropical family Gesneriaceae was greatly in need of revision. No monographic treatment had been published since 1865, and the only authority on the group was Prof. K. Fritsch of Vienna, since deceased. Accordingly the author was invited by Dr. H. A. Gleason to prepare an account of this family for publication in North American Flora. Work on the genus *Besleria* was thereupon begun, and this has continued intermittently, four short papers having been published.[1]

In the present paper 141 species are described, of which about one-third are new. Owing to limitations of space the older species are very briefly described, only the more important diagnostic characters being given.

In this study types or isotypes of nearly all the described species of *Besleria* have been examined. For the loan of these, as well as many other valuable specimens, the author is under great obligation to the following institutions: Botanisches Museum, Berlin-Dahlem (B); Jardin de l'Etât, Brussels (Br); University of California, Berkeley (C); Botanisk Museum, Copenhagen (Co); Field Museum of Natural History, Chicago (F); Gray Herbarium of Harvard University (G); Royal Botanic Gardens, Kew (K); University of Michigan, Ann Arbor (Mi); Missouri Botanical Garden, St. Louis (Mo); Academy of Natural Sciences, Philadelphia (P); Naturhistoriska Rijksmuseet, Stockholm (S); New York Botanical Garden (Y). The United States National Herbarium is indicated by W.

HISTORY OF THE GENUS

The genus *Besleria* has not gone through the nomenclatural vicissitudes of many genera of this and other families. Its validity has never been questioned. The first description is by Plumier, who

[1] "The Genus *Besleria* in British Guiana," Phytologia **1**: 151–153. 1935; "Synopsis of the Species of *Besleria* in Ecuador," Proc. Biol. Soc. Washington, **48**: 55–58. 1935; "The Genus *Besleria* in Venezuela," Proc. Biol. Soc. Washington, **48**: 73–76. 1935; "The Genus *Cremosperma*," Journ. Washington Acad. Sci. **25**: 284–291. 1935.

recognized three species: *Besleria virgae aureae foliis, flore lutea* [*Besleria lutea* L.], *Besleria Melissae, tragi facie* [*Besleria melittifolia* L.] and *Besleria scandens, cristata, fructu nigro* [*Besleria cristata* L.]. These three were the only species known to Linnaeus. Subsequent authors have considered them as representing three generic types. *Besleria melittifolia* is now referred to *Episcia, B. cristata* to *Alloplectus*, and *B. lutea* remains as the type of *Besleria*. This segregation was first made in 1829 by Martius, who has been followed by all subsequent authors.

Additional species were proposed by Forster, Aublet, Humboldt, Bonpland, and Kunth, Martius, Poeppig, and other older authors, a good many of these now being referred to other genera. The first significant work on the genus was that of Oersted, who in his Centralamericas Gesneraceer [2] published a new classification of the family, in which the genus *Besleria* was restricted to *B. lutea*, the remaining species being distributed among five genera: *Pseudobesleria, Parabesleria, Cyrtanthemum, Gasteranthus*, and *Gasteranthopsis*.

The only monographer of Gesneriaceae was Dr. Johannes Hanstein, who worked almost exclusively on material in the Berlin Herbarium. He published revisions or synopses of the various genera in several volumes of Linnaea, that of *Besleria* appearing in 1865.[3] In this, all the above-mentioned genera were reduced by him to synonymy, *Gasteranthus, Pseudobesleria*, and *Parabesleria* being retained as subgenera. In addition, two new subgenera, *Macrobesleria* and *Rhynchobesleria*, were described. *Besleria lutea* was retained as the sole species of subgenus *Eubesleria*.

The treatment in the Genera Plantarum of Bentham and Hooker followed that of Hanstein in every particular, except that the subgenera were reduced to sectional rank and one new section was proposed, i. e. *Podobesleria*, which has existed up to the present time without any described species. Fritsch's account in Die Natürlichen Pflanzenfamilien was modeled on that of Bentham and Hooker, and did not add anything to our knowledge of the genus.

More recently the Central American species were studied by Capt. John Donnell Smith, who at intervals published several interesting and curious species, one of which must be excluded from the genus. The few West Indian species were treated by Urban.[4] The only other important work on the genus is that of Dr. K. Fritsch, who in two papers [5] has published a considerable number of new Andean species.

[2] Dansk. Vid. Selsk. Skrivt. V. 5: 77–152. *pl. 1–11*. 1861.

[3] Linnaea 34: 316–337.

[4] Symb. Antill. 2: 347–354. 1901.

[5] Repert. Sp. Nov. Fedde 18: 7–13. 1922; and Notizbl. Bot. Gart. Berlin 11: 962–976. 1934.

DIAGNOSTIC CHARACTERS

All species of *Besleria* are of perennial duration, propagating chiefly by means of seeds. A very few are truly herbaceous, but the majority are best described as suffrutescent or soft-woody. However, a considerable number are truly shrubby or even arborescent in habit, although as a rule they do not have the appearance of shrubs owing to the fact that the main stem is usually quite unbranched. The difficulty of classifying the species according to habit is well illustrated in *B. variabilis*, the range of variation, according to herbarium labels, being from succulent herbs 2 feet high to trees of 15 feet. Such variation would hardly seem allowable within a single species, particularly since the specimens are of fully mature plants, and the collectors' notes made by professional botanists; but, inasmuch as the herbarium specimens collected do not differ in appearance, it may be presumed that the classification as herbs, shrubs, or trees was based chiefly on size. The habit of *B. pansamalana* of Guatemala is perhaps unique within the genus, and is described in the field by Dr. Alexander F. Skutch as follows: "Herb with stems up to 8 feet long, trailing on the ground and rooting at both nodes and internodes, the apex and lateral branches erect to a height of 2 or 3 feet." Most of the species are terrestrial, but a few are seemingly epiphytic at times. A scandent habit is ascribed to several species by collectors. In general it may be said that in this genus distinctive data as to habit are difficult to gain from herbarium specimens. Habital data here stated in the specific descriptions are given on the authority of collectors' notes, rather than from observation on the part of the author.

The stems, as above stated, are normally unbranched and mostly terete. However, those of a good many species are obtusely quadrangular, at least below. Here again, herbarium specimens are an insufficient guide, and little use has been made of this character. The stems vary from slender (e. g. *B. salicifolia*) to extremely coarse and fleshy (*B. tambensis*, *B. maxima*, *B. robusta*). From a practical viewpoint, and perhaps also from a phylogenetic, the most important character of the stems is as to type of pubescence. This is, indeed, remarkably variable, and is apparently constant within a species. Entirely glabrous stems are not found, and they would hardly be expected in this family, which is notable for the diversity and abundance of the hairy covering in all parts of the plant. In *B. gracilenta*, however, a high magnification is necessary to discern the few hairs present. In most species the stems are obviously strigose or strigillose, especially toward the growing point. In some the dense hairy covering may truly be called sericeous. In a few species, such as *B. reticulata* (*typica*), the stems are densely lanate-tomentose, or (in *B. tambensis*) velutinous-tomentose, or (in *B. maxima*) villous-tomentose.

A truly hirsute type of pubescence, with long, spreading hairs not at all matted, is characteristic of a large number of species belonging to several distinct groups. In a few species the pubescence is somewhat intermediate between these types, and is described by such terms as "subappressed-pilose" or the like. Although the types of pubescence seem to be a safe guide to affinity, the writer does not deem it of sufficient importance to justify formal groupings based on this character.

The leaves are always petiolate, although the petiole may be greatly abbreviated, as in *B. lutea* var. *imrayi*. The relative length of petiole and leaf blade varies, but the ratio is commonly about 1:3 or 1:4. Rarely, as in forms of *B. variabilis*, the petiole may almost equal the blade. In outline, the blades are commonly elliptic or broadly elliptic but vary to oblanceolate or oblong, or rarely to lanceolate or linear-lanceolate. The apex is usually acuminate, rarely rounded and cuspidate-acuminate, or merely acute. The base is usually cuneate, rarely rounded or obtuse. The margin is often given in the descriptions as "entire", although strictly speaking that is probably never wholly true, some vestiges of denticulation being visible on close study. On the other hand, those species described as "denticulate" have teeth of measurable length, although these also are remote and relatively inconspicuous. A good many species have obviously serrulate or serrate leaves, particularly those in the more advanced sections, such as *Rhynchobesleria* or *Gasteranthus*. The margin is irregularly sinuate-dentate in *B. perennis*, regularly and closely crenulate in a few species (e. g. *B. leucostoma*).

In texture the leaf blades vary from thin-membranous (as in *B. longipes*) to thick-coriaceous (*B. cognata*). They are sometimes pellucid-punctate (*B. labiosa*). The pubescence of the veins of the lower leaf surface is always exactly correlated with that of the stem and, like that, varies from absent, through strigose and puberulous, to tomentose or hirsute. The upper surface does not show the pubescence characteristic of the species and is usually glabrous or glabrate, the hairs when present commonly being sparse and subappressed. In *B. crassa* the fleshy leaves are minutely verrucose on both surfaces. Three species, wholly unrelated in floral characters, have a most striking peculiarity in common: the upper surface is elongate-tuberculate, each tubercle being surmounted by a long, setiform, deciduous hair.

The venation of the leaf blades in *Besleria* is similar to that obtaining in the rest of the family, being pinnate, with arcuate, anastomosing lateral veins. The number of pairs of lateral veins is relatively constant and is stated for each species. The veins are sometimes obscure (*B. crassa*), sometimes impressed above (*B. impressa*), sometimes prominently reticulate (*B. heterosepala*, *B. reticulata*).

Taken as a whole the characters exhibited by the leaf blades, especially those of pubescence, toothing, and venation, are constant within a species, and consequently have proved of great value in distinguishing species related by floral characters. They have been freely used in the key, in most instances as supplementary to more fundamental differences in the inflorescences.

Although theoretically the inflorescence is racemose, a character retained in *B. racemosa*, actually it is often subumbellate by reduction of the axis. Very often the common peduncle is well developed, sometimes exceeding the leaves, but in several large subsections it is vestigial, in which case the term obsolete is used in the descriptions. The inflorescence then becomes a sessile umbel, the flowers appearing aggregate in the leaf axils. In a very few of the more advanced species, such as *B. princeps*, the common peduncle appears to be entirely absent, the flowers then being solitary in the axils. In a few species (e. g. *B. formosa*) the flowers seem to be borne on a solitary axillary pedicel, yet close examination shows that the pedicel is jointed in its lower third, the inflorescence being therefore a 1-flowered umbel. Intermediate conditions between these types are found. For convenience such intermediate species are keyed under both headings. In spite of these intergrades, the type of inflorescence furnishes a very good and practical criterion for subsectional arrangement.

The calyx is highly variable in form, and provides many characters useful in classifying the species. Typically it is 5-parted almost to base. In a few species the segments are partially connate, sometimes up to the middle, or in subsection Typicae to over two-thirds their length. In outline the lobes vary from orbicular to linear-lanceolate. The relative length of calyx and corolla is frequently correlated with the shape of the calyx lobes. Rounded lobes are usually only one-third to one-sixth as long as the corolla tube, but there are exceptions (e. g. *B. rhytidophyllum*). On the other hand, the lanceolate, acuminate calyx lobes are usually more than half as long as the corolla tube, and sometimes even equal or exceed it. The midrib is often conspicuous and sometimes forms an evident keel. In some species it is excurrent as a mucro, which frequently arises below the apex of the sepal. Lateral veins range from prominent to obscure. In a few species the midrib is absent, the venation then being irregularly reticulate. The segments are commonly membranous, rarely somewhat thick and coriaceous. Their outer surface is usually hairy, the pubescence being of all the various types above discussed. In most species the inner surface is glabrous, the development of pubescence being evident in only a few advanced specific types. The margins are commonly ciliolate or ciliate, and entire, but rarely are erose, crenulate, or incised-serrate. Although few herbarium specimens bear notes on this point, it is evident that the calyx is usually bright-colored, green lobes being

a rare exception. The dominant color is doubtless orange, but white, yellow, red, or brown calyces are also known. Additional characters of the calyx are found in the relative size and shape and the degree of imbrication of the lobes. Subequal lobes are the rule, but several notable exceptions occur (e. g. *B. heterosepala*, *B. cyrtanthemum*). None of the species here described have wholly identical calyx lobes, and it would therefore be possible theoretically to provide a key based on them alone, although such a key would present difficulties both in construction and use.

The tubular corolla is erect, oblique, or horizontal in relation to the calyx. In color it may be white, yellow, orange, red, or spotted, but becomes a dull yellowish brown in drying. The base, commonly cylindric, is spurred in sections *Neobesleria* and *Gasteranthus*. In most species the tube is markedly ventricose upwardly and contracted toward the throat. In *Neobesleria*, however, the tube is narrowly infundibular, being gradually widened up to the open throat. The limb is usually terminal and composed of five small, orbicular, subequal, erect or patent lobes, but in *Rhynchobesleria* the limb is obviously bilabiate with unequal lobes. In *Gasteranthus* the corolla is of a very peculiar shape, difficult to describe. It bears a rather remote resemblance to a shoe, the orifice being distinctly lateral and the apex of the corolla the very much inflated and extended corolla tube. In these species the limb is small and regular. A good illustration is that of *B. pansamalana* in the Botanical Gazette **17**: 197. *pl. 17*. 1891).

Externally the corolla tube is either glabrous or hairy. Throughout the genus the author has used the characters of hairy corolla and hairy ovaries as marks of specific distinction, because as a rule species differing in one or both of these points are found to differ in several other respects as well. Since these characters are easily and definitely observable they have been given special importance in the key. It should not be assumed, however, that this has resulted in a natural key.

Only four stamens are fertile, although a rudimentary fifth is frequently developed, this sometimes bearing an abortive anther. The filaments are broad and flattened and are inserted on the corolla tube, usually a few millimeters above the base. They are free from each other throughout, but the anthers are often lightly connate in a square. At maturity the anthers are commonly free, but remain connivent. They are never exserted except in *B. pendula*, although sometimes borne in the throat of the corolla. The more usual position is slightly farther down in the corolla tube. The anther itself is composed of two cells which are early confluent at apex except in the aberrant species *B. pycnosuzygia*. Little use has been made of stamen characters in the keys and descriptions.

As in all Gesneriaceae, the ovary is 1-celled with two parietal placentae. Each placenta is divided into two lamellae, both of which bear a large number of ovules on the inner surface. In a single species (*B. maxima*) the lamellae apparently bear ovules on both the inner and outer surfaces, but this point needs further study. The ovary and style may be glabrous or variously pubescent. Typically the stigma is bilobed, but often the lobes are so short that the stigma may be described as stomatomorphic.

At the base of the ovary is a well-developed glandular disk, which, from such observations as have been made in the field, is brightly colored and copiously nectariferous. Commonly it is annular, entire, and glabrous, but in a number of species one side is obsolete, the disk then being semiannular. In those species with posteriorly spurred corollas there is frequently a marked thickening of the disk posteriorly, often accompanied by a development of pubescence; in which case the anterior portion of the disk is poorly developed or absent. In such, the disk is described as reduced to a posterior "gland," but this gland is not exactly comparable to the disk glands of *Columnea*. In one species, *B. comosa*, the disk is composed of a true gland, this being oblong, glabrous, and without any annular tendency. The propriety of retaining this species in *Besleria* is questionable.

The fruit is a fleshy berry, white, red, orange, or purple. The color is not retained in dried specimens. The skin of the berry is usually thick and roughly verrucose. The numerous minute seeds are red, fusiform, and marked with spiral striae, as in most Gesneriaceae. There are no apparent differences between the species in seed characters.

SECTIONAL ARRANGEMENT

The sectional arrangement adopted is essentially that of Hanstein. One section, *Neobesleria*, is here proposed to include certain species, part of which have been previously placed in *Gasteranthus* and part in *Eubesleria*. The subgenus *Macrobesleria* Hanst. is reduced to *Rhynchobesleria*, and *Pseudobesleria* and *Parabesleria* are reduced to *Eubesleria*. From present knowledge it is impossible to present a truly natural arrangement. Within the sections a number of subsections have been created, which will serve adequately for a practical classification, but which are almost certainly not phylogenetically accurate. Species intermediate between the subsections are fairly numerous, and have therefore been included in two places in the key, to facilitate identification.

GENERIC RELATIONSHIP

Besleria belongs to the subfamily Cyrtandroideae, characterized by having a wholly superior ovary. Among American species of this subfamily it is distinguished from all but *Cremosperma* by having the anther cells confluent at apex, the disk of an annular type, and the fruit a fleshy berry. In addition, most species have in common certain habital resemblances which make the genus easily recognizable, e. g. the erect soft-woody stems, the equal pairs of leaves, the absence of bracts, and the frequently umbellate type of inflorescence. The free filaments and the development of ovules on only the inner surface of the lamellae of the placentae are also distinguishing characters.

The most closely related genus is *Cremosperma*, which was reduced to *Besleria* by Fritsch. In a recent paper the writer restored *Cremosperma* to generic rank and recognized ten species. One of these, *C. cinnabarinum*, was doubtfully so referred on the authority of Fritsch. An examination of the type now shows that this species is a true and rather typical *Besleria*. Excluding this, *Cremosperma* remains a compact group of closely related species, distinguished from *Besleria* as follows:

Filaments inserted in middle of corolla tube; calyx turbinate or turbinate-cylindric, 10-ribbed; inflorescence capitate-racemose, pedunculate; plants herbaceous or suffrutescent, 30 cm high or less ..... **Cremosperma**

Filaments inserted in base of corolla tube; calyx commonly campanulate or urceolate, not 10-ribbed; inflorescence usually a sessile or pedunculate umbel; plants usually soft-woody shrubs more than 30 cm high ..... **Besleria**

A fuller discussion of the relationship of *Besleria* to *Anetanthus*, *Episcia*, and other genera must await revisions of these groups.

GEOGRAPHIC DISTRIBUTION

As is well known, the Gesneriaceae in general are of extremely local distribution. The classic example is, of course, *Cyrtandra*, the various species of which are almost all restricted to individual islands in the South Seas, and often to certain valleys or mountain slopes. The American genera, and *Besleria* in particular, are no exception to this rule. E. P. Killip has remarked that, in traversing the Andes, on passing over a divide the gesneriaceous flora was observed to change completely. This pronounced endemism explains why so many of the species are represented only by single collections.

Moreover, many collections have been made in the vicinity of settlements and along mountain trails, but relatively few in the dense virgin forests which are the preferred habitat of most Gesneriaceae. Even within suitable areas the plants are as a rule widely scattered and often only sparingly floriferous. On account of this rarity only

a relatively small percentage of the species are represented in any one herbarium. The number of new species here described would be thought excessive in most groups; it is explained by the amount of new material available and the fact that almost no work has been done on this family for over 70 years. The species of *Besleria* are apparently not in a very plastic condition. Intergrades between species are uncommon, and even species represented by numerous specimens exhibit few pronounced variations in appearance or in essential characters.

The actual rarity of the species is well shown by a consideration of those known from Mexico. Four were described from Mexico by Oersted in 1858. These are *B. glabra*, *B. deflexa*, *B. cyrtanthemum*, and *B. hirsuta*, none of which have since been collected in Mexico or found elsewhere, except perhaps *B. hirsuta*. I have so identified one Costa Rican collection, but it does not agree in all respects with the type and with better material may be found specifically distinct. Besides these, the only other species known from Mexico is the widespread and common lowland *B. laxiflora*, which reaches its northern limit in Chiapas, where it has been collected twice.

In Guatemala there are four species, all endemic except *B. laxiflora*. Two of these, *B. flava* and *B. conspecta*, are more closely related than their position in the present treatment would indicate. The third, *B. pansamalana*, is the only North American representative of the section *Gasteranthus*. Remarkably enough, it is very closely related indeed to a species found in Ecuador.

The common *B. laxiflora* is found in British Honduras, Honduras, and Nicaragua, and one other widespread species, *B. solanoides*, reaches its northern limit in Honduras.

Twenty-one species and three varieties are found in Costa Rica and adjacent Panama, all of which are endemic, except *B. hirsuta* (above discussed), *B. laxiflora*, *B. pauciflora*, *B. solanoides* with its variety, and *B. triflora*, a variety of which is found in Colombia. The endemic species are limited in range within Costa Rica. Five species, viz. *B. trichostegia*, *B. robusta*, *B. macropoda*, *B. acropoda*, and *B. imbricans*, are nearly restricted to elevations below 600 meters in the Province of Limón, on the Atlantic coast. The remainder, viz. *B. triflora*, *B. barbensis*, *B. pycnosuzygia*, *B. notabilis*, *B. standleyi*, *B. formosa*, *B. wendlandiana*, *B. princeps*, and *B. columneoides*, are found chiefly in the central mountain region at elevations up to 2,400 meters. The Panama species are *B. amabilis*, *B. panamensis*, *B. pauciflora*, *B. laxiflora*, and *B. solanoides*.

The West Indian species are six in number: *B. lutea*, *B. lanceolata*, *B. filipes*, *B. elongata*, *B. petiolaris*, and *B. solanoides;* all but the last are endemic. Except for *B. lutea*, which is found throughout the West Indies except Puerto Rico, all the others are confined to the Lesser

Antilles, often to a single small island. A very peculiar species, *B. seitzii*, is endemic in Tobago. Three endemic species, *B. longipes*, *B. strigillosa*, and *B. sieberiana*, are found in Trinidad.

The South American members of the genus are equally local. Of the 43 species found in Colombia only eight extend beyond the confines of that country. Two of these, which inhabit the Amazonian watershed, naturally enough are found also in Amazonian Peru, viz. *B. immitis* and *B. ignea*. Two, *B. rupestris* and *B. calcarata*, extend across the southwestern borders into Ecuador. One species, *B. affinis*, is found also in Venezuela and two, *B. solanoides* and *B. triflora*, occur likewise in Costa Rica. *Besleria pauciflora* is here accredited to Bolivia, Colombia, and Panama, but the forms from these three regions are not entirely alike and may not be conspecific. The percentage of endemism is at least equally high for other South American countries. It has thus seemed desirable to insert geographic data in the keys, as an aid to rapid identification.

SYSTEMATIC TREATMENT

BESLERIA [Plum.] L.

Besleria [Plum.] L. Gen. Pl. 181. 1737.
Eriphia P. Br. Hist. Jam. 270. 1756.
Gasteranthus Benth. Pl. Hartw. 233. 1846.
Cyrtanthemum Oersted Centralamer. Gesn. 56. 1858.
Gasteranthopsis Oersted, op. cit. 55.
Parabesleria Oersted, op. cit. 52.
Pseudobesleria Oersted, op. cit. 54.

Herbs or shrubs with terete or quadrangular, usually unbranched stems; leaf blades opposite, equal, petiolate, usually elliptic, acute or acuminate at apex, cuneate or rounded at base, membranous to coriaceous, subentire, denticulate, or coarsely toothed, usually discolorous, pinnately veined; flowers ebracteate, commonly borne in axillary pedunculate or sessile umbels, rarely solitary; calyx campanulate or urceolate, rarely cylindric, 5-toothed or mostly 5-parted nearly to base, colored, the lobes imbricate in aestivation, rounded to acuminate, mostly entire; corolla tubular, erect or horizontal in calyx, cylindric or spurred at base, often pilose, the tube usually ventricose, rarely infundibular, the limb terminal or lateral, actinomorphic or zygomorphic; fertile stamens 4, didynamous, the filaments attached to base of corolla, not connate, flattened, usually glabrous, the anthers quadrate, connate when young, 2-celled, the cells confluent at apex; ovary superior, 1-celled, with two parietal placentae, these ovuliferous on the inner surface only; style elongate, the stigma bilobed or stomatomorphic; disk annular, commonly glabrous, entire, rarely posteriorly thickened; fruit a fleshy berry with thick verrucose exocarp, the seeds minute, numerous, red, spirally striate. Type: *Besleria lutea* L.

KEY TO SECTIONS

Orifice of corolla terminal.
Corolla not spurred, but sometimes a little saccate at base.
Limb of corolla regular or nearly so, the tube contracted in throat
I. EUBESLERIA.

Limb of corolla bilabiate, the tube widened in throat..III. RHYNCHOBESLERIA.
Corolla spurred at base posteriorly. Disk often thickened posteriorly, glabrous or pubescent.....II. NEOBESLERIA.
Orifice of corolla lateral, much exceeded by the inflated corolla tube IV. GASTERANTHUS.

Section I. EUBESLERIA (Hanst.) Benth. & Hook.

Folia alterna, saepe subintegra; pedunculus communis elongatus vel obsoletus, pedicellis saepe numerosis, raro solitariis; calycis lobi liberi vel connati, saepe integri, interdum mucronati; corolla erecta ecalcarata, tubo ventricoso, fauce contracta, limbo terminali subregulari parvo; discus saepe annularis, glaber. Typus: *B. lutea* L.

KEY TO SUBSECTIONS

Calyx lobes less than half as long as the corolla tube, mostly rounded or obtuse
Common peduncle obsolete, the pedicels aggregate in the leaf axils..1. SESSILES
Common peduncle elongate, the pedicels umbellate or subcorymbose 2. PEDUNCULATAE.
Calyx lobes half as long as the corolla tube or more, usually acute or acuminate.
Lobes of calyx free or rarely connate to middle.
Common peduncle obsolete, the pedicels aggregate in the leaf axils.
Disk reduced to an oblong erect gland 2.5 mm high.....3. COMOSAE.
Disk annular or semiannular, 1 mm high or less.
Calyx lobes with a filiform mucro arising below the apex..4. MIRIFICAE.
Calyx lobes not mucronate.
Lobes of calyx strongly unequal, the longest exceeding the corolla 5. MEXICANAE.
Lobes of calyx subequal, never exceeding the corolla..6. CONFERTAE.
Common peduncle elongate, the pedicels umbellate or subcorymbose 7. ELONGATAE.
Lobes of calyx connate for over two thirds their length.....8. TYPICAE.

1. SESSILES. Herbae vel saepe frutices; pedunculus communis obsoletus vel raro ad 4 mm longus, pedicellis saepe numerosis; calycis lobi liberi (numeris 9, 17, 20 et 37 exceptis), saepe obtusi vel rotundati, 3–7 mm longi (usque ad 9.5 mm in numeris 18, 32 et 37), saepe integri (numeris 5a et 25 exceptis), intus glabri; corolla erecta vel paullo obliqua, basi non calcarata, fauce contracta, limbo terminali brevi; discus annularis vel semiannularis (numeris 15 et 25 exceptis). Typus: *B. solanoides* H. B. K.

A. Stems, petioles and leaf veins lanate-tomentose, puberulous, strigillose or glabrate. Calyx lobes obtuse or rounded, except in nos. 5, 18 and 25.
B. Calyx lobes not mucronate.
C. Corolla tube glabrous externally or very minutely puberulous.
D. Ovary and style glabrous.
Corolla with a hairy ring within at insertion of filaments; leaves coriaceous. Colombia.....**14. B. cognata.**
Corolla lacking a hairy ring within; leaves membranous.
Leaf blades serrate. Trinidad.....**21. B. strigillosa.**
Leaf blades entire or remotely denticulate.
Disk reduced to a posterior gland; leaf blades entirely glabrous beneath. Mexico.....**15. B. glabra.**
Disk annular or semiannular; leaf blades puberulous or strigillose, at least on the veins beneath, except in no. 9.

Corolla yellow; petioles 5.5–9 cm long. Leaf blades 7.5–10.5 cm wide, the veins 9–11 pairs. Guatemala--**16. B. conspecta.**

Corolla orange or red; petioles 1–3 cm long (or up to 6 cm in no. 17).

Stems, leaf blades and inflorescence almost entirely glabrous, the hairs sparse, microscopic. Leaf blades narrowly lanceolate; calyx lobes suborbicular. Peru.
9. B. gracilenta.

Stems, leaf blades and inflorescence appressed-pubescent.

Corolla tube, at least usually, not over 4 mm wide, thin-membranous; calyx lobes longer than broad.

Calyx lobes membranous; leaf surface glabrous or nearly so.

Leaf blades commonly over 10 cm long and 3 cm wide; stems not scabrous. Honduras to Peru; West Indies----------**1. B. solanoides.**

Leaf blades 3.5–9 cm long, 1–2 cm wide; stems subscabrous. Colombia.
1b. B. solanoides var. parvifolia.

Calyx lobes coriaceous; leaf surface strigillose. Colombia.
2. B. lehmannii.

Corolla tube 5–6.5 mm wide, thicker; calyx lobes broader than long.

Leaf blades long-petiolate, the primary veins 8–11 pairs; flowers usually in pairs. Corolla dark red; calyx lobes orange, coriaceous, erose. Colombia.
17. B. nitens.

Leaf blades short-petiolate, the primary veins 5 or 6 pairs; flowers usually solitary.

Common peduncle developed, i. e. flower stalk jointed above base. Costa Rica----------**59. B. formosa.**

Common peduncle obsolete, the flower stalk jointed at base. Colombia--**42b. B. reticulata var. venosa.**

DD. Ovary and style puberulous.

Corolla tube thick (5–6 mm wide), obviously saccate at base; calyx lobes suborbicular, broader than long, strongly imbricate; leaf blades obtuse or rounded at base, broadly elliptic, membranous. Costa Rica----------**23. B. standleyi.**

Corolla tube slender (not over 3 mm wide except in no. 3), not saccate at base; calyx lobes oblong or ovate, longer than broad, scarcely imbricate (except in no. 3); leaf blades cuneate or attenuate at base.

Stems thick, commonly 5–11 mm in diameter; leaf blades subcoriaceous, 6–10 cm wide. Costa Rica----------**24. B. notabilis.**

Stems slender, usually 2–3 mm in diameter, rarely up to 6 mm; leaf blades 5.5 cm wide or usually less.

Leaf blades oblanceolate, often subcoriaceous; ovary with short, appressed hairs. Colombia----------**8. B. angustiflora.**

Leaf blades narrowly or broadly elliptic, chartaceous or membranous; ovary with spreading hairs.

Hairs of leaf veins beneath not over 0.25 mm long; calyx lobes merely strigillose, minutely ciliolate.

Calyx lobes suborbicular, imbricate, venose; corolla tube 6–8 mm wide. Colombia----------**3. B. delvillari.**

Calyx lobes oval, scarcely imbricate, not venose; corolla tube about 3 mm wide. Ecuador.....**4. B. modica.**

Hairs of leaf veins 0.5–1.25 mm long; calyx lobes subpilose, long-ciliate. Costa Rica and Colombia.

1a. B. solanoides var. tenera.

CC. Corolla tube pilose or strongly puberulous externally.

Corolla with a hairy ring within at insertion of filaments.

Ovary glabrous. Peru.....**13. B. densiflora.**

Ovary hairy.

Anther cells confluent; corolla sparsely puberulous or pilosulous.

Leaf blades elliptic or broadly oblong, minutely strigillose on the veins beneath. Colombia.....**11. B. leucocarpa.**

Leaf blades oblanceolate, subtomentose on the veins beneath. Colombia.....**10. B. nemorosa.**

Anther cells not confluent; corolla long-pilose. Costa Rica.

12. B. pycnosuzygia.

Corolla lacking a hairy ring within. Ovary hairy.

Leaf blades less than 4 cm wide (except in nos. 57 and 58a), the lateral veins 4–8 pairs. Calyx lobes strigose or subpilose.

Corolla limb about 15 mm wide, exceeding the length of the corolla tube. Panama.....**57. B. amabilis.**

Corolla limb not over 7 mm wide, much less than the length of the corolla tube.

Calyx lobes orbicular, strongly imbricate. Colombia.

58a. B. triflora var. australis.

Calyx lobes ovate, oblong or lanceolate, little imbricate.

Corolla densely pilose. Calyx lobes oblong, rounded at apex. Colombia.....**7. B. pennellii.**

Corolla sparsely pilosulous.

Calyx lobes lanceolate, acuminate, ciliolate, strigillose.

Calyx lobes entire, not venose. Colombia.

5. B. microphylla.

Calyx lobes serrulate, venose

5a. B. microphylla var. serrulata.

Calyx lobes oval or oblong, rounded or obtuse, long-ciliate, subpilose.

Corolla crimson, horizontal or strongly oblique; berry white; leaf veins 4 pairs. Ecuador.....**6. B. miniata.**

Corolla orange, erect or nearly so; berry orange; leaf veins 8 pairs. Costa Rica and Colombia.

1a. B. solanoides var. tenera.

Leaf blades 4.5–12 cm wide, the lateral veins 8–14 pairs.

Stems very thick (about 7 mm in diameter even near apex), densely velvety-tomentose; calyx lobes 4 mm long. Colombia.

26. B. tambensis.

Stems slender, villous or strigose; calyx lobes 6.5–8 mm long. Corolla yellow.

Disk reduced to a posterior gland; calyx lobes pilosulous, often toothed. Colombia.....**25. B. illustris.**

Disk annular; calyx lobes strigillose, entire. Colombia.

18. B. nubigena.

BB. Calyx lobes with a mucro arising from below apex. Corolla yellow.
Leaf blades thick-coriaceous, lightly crenulate. Pedicels stout. Martinique and Guadeloupe---22. **B. lanceolata.**
Leaf blades membranous or chartaceous, serrate, except in forms of no. 19.
Pedicels 3.5–5 cm long.
Leaf blades sharply serrate.
Stems glabrous, except at nodes; leaf blades oblanceolate, 4.5–5.5 cm wide. Guadeloupe---19. **B. filipes.**
Stems strigillose; leaf blades elliptic, 6–8.3 cm wide. Dominica.
19a. **B. filipes f. latior.**
Leaf blades crenulate.
Stems glabrous except at nodes; leaf blades entirely glabrous. Dominica.
19b. **B. filipes f. glaberrima.**
Stems sericeous; leaf blades strigillose on the veins beneath. Dominica.
19c. **B. filipes f. pilicaulis.**
Pedicels 1.5 cm long or less. Trinidad---20. **B. sieberiana.**
AA. Stems, petioles, and leaf veins beneath hirsute.
Corolla glabrous externally; ovary glabrous.
Leaf blades thick-coriaceous, over three times as long as wide, not over 3.5 cm wide, crenulate. Martinique and Guadeloupe.
22. **B. lanceolata.**
Leaf blades membranous or chartaceous, less than three times as long as wide, denticulate or serrulate.
Sepals rounded at apex.
Leaf blades chartaceous.
Blades 22–26 cm long and 10–13 cm wide; calyx lobes long-white-ciliate. Peru---28. **B. barbata.**
Blades not over 9 cm long and 3.5 cm wide; calyx lobes not ciliate. Peru---29. **B. imberbis.**
Leaf blades thin-membranous.
Blades oblong, evenly acuminate, the veins 11–13 pairs. Mexico and Costa Rica---30. **B. hirsuta.**
Blades broadly elliptic, cuspidate-acuminate, the veins 8–10 pairs. Colombia---31. **B. fecunda.**
Sepals sharply acuminate. British Guiana---32. **B. saxicola.**
Corolla pubescent externally; ovary hairy.
Calyx lobes suborbicular, broadly rounded. Colombia---33. **B. villosa.**
Calyx lobes acute or acuminate.
Corolla with a hairy ring within at insertion of filaments. Colombia.
34. **B. vestita.**
Corolla lacking a hairy ring within.
Leaf blades elongate-tuberculate above, each tubercle surmounted by a long hair. Colombia---35. **B. laeta.**
Leaf blades not tuberculate above.
Disk reduced to a posterior gland; calyx lobes often toothed. Colombia---25. **B. illustris.**
Disk annular (semiannular in no. 36); calyx lobes entire.
Leaf blades broadly oblong, 11–25 cm wide; stems densely tomentose-villous; flowers very numerous in a cluster (15 or more.) Corolla only sparsely pilosulous. Colombia---27. **B. maxima.**
Leaf blades elliptic or oblanceolate, not over 7 cm wide; stems hirsute; flowers fewer than 10 in a cluster (except in no. 40).
Blades oblanceolate; calyx lobes linear-lanceolate, narrowed to a filiform apex. Costa Rica---36. **B. trichostegia.**

Blades elliptic; calyx lobes ovate or lanceolate, acute or short-acuminate.

Calyx lobes ovate, 9.5 mm long, united for one third their length, orange without, green within, the tips recurved. Bolivia.....**37. B. montana.**

Calyx lobes lanceolate, not over 6 mm long, free, the tips not recurved.

Corolla tube ventricose upwardly, sparsely pilose, the lobes small, nearly equal.

Leaf blades entire. Bolivia.....**38. B. boliviana.**

Leaf blades minutely crenulate. Colombia.
39. B. leucostoma.

Corolla tube cylindric, densely tomentose, the lobes relatively large, somewhat unequal. Colombia.
40. B. cinnabarina.

2. Pedunculatae. Folia saepe subintegra vel denticulata; pedunculus communis saepe elongatus, pedicellis umbellatis vel subcorymbosis; calycis lobi integri, saepe liberi, saepe obtusi vel rotundati, 2.5–7.5 mm longi, intus glabri; corolla erecta ecalcarata plus minusve ventricosa, fauce contracta, limbo terminali, fere regulari; discus saepe annularis vel semiannularis, glaber. Typus: *B. variabilis* Morton.

A. Stems and leaves hirsute.

Calyx lobes and corolla tube glandular-pilose. Calyx lobes acute, mucronate; ovary hairy. So. Brazil.....**96. B. grandifolia.**

Calyx lobes and corolla tube not glandular.

Corolla tube glabrous externally; calyx lobes suborbicular, rounded at apex; ovary and style glabrous. Colombia.....**31. B. fecunda.**

Corolla tube densely pilosulous externally; calyx lobes linear-lanceolate, acuminate; ovary and style pilosulous. Bolivia.....**41. B. sprucei.**

AA. Stems and leaves lanate-tomentose, appressed-pubescent, or glabrate.

B. Corolla tube glabrous externally. Ovary glabrous.

Stems lanate-tomentose or densely sericeous; leaf blades persistently tomentulose on the lower surface, the veins usually reticulate. Calyx lobes not mucronate.

Calyx lobes narrowly oblong, densely strigillose, not veiny.

Petioles 15–23 mm long. Colombia.....**42. B. reticulata.**

Petioles not over 7 mm long. Colombia.
42a. B. reticulata var. pubistyla.

Calyx lobes broadly oblong, glabrate, conspicuously veiny. Colombia.
42b. B. reticulata var. venosa.

Stems strigose or glabrate; leaf blades glabrate or puberulous on the lower surface.

Lobes of calyx mucronate.

Calyx 7.5–14 mm long.

Calyx lobes connate to above middle. Venezuela.....**46. B. connata.**

Calyx lobes free or connate only at base. Mexico to South America
91. B. laxiflora.

Calyx 3–5 mm long.

Inflorescence subcorymbose, many-flowered; leaf veins 8–15 pairs.

Corolla 20 mm long or more.

Corolla yellow, orange, or red.

Outer corolla lobes glabrous or puberulous. Peru, Bolivia.
45. B. variabilis.

Outer corolla lobes densely bearded. Peru.
45a. B. variabilis f. barbatula.

Corolla greenish-white. Peru---**45b. B. variabilis f. pallida.**

Corolla 13–16 mm long. Venezuela and Colombia-**44. B. affinis.**

Inflorescence usually umbellate, few-flowered; leaf veins 5–8 pairs.

Leaf blades serrulate. Venezuela----------**47. B. mucronata.**

Leaf blades subentire. Peru----------**43. B. lucida.**

Lobes of calyx not mucronate.

Corolla white, 5–6 mm long; primary leaf veins 16–18 pairs. Peru.
48. B. minutiflora.

Corolla yellow or red (rarely white), more than 1 cm long; leaf veins 5–13 pairs.

Disk reduced to an emarginate posterior gland. Corolla pale yellow; peduncles shorter than the pedicels; leaf blades not over 3 cm wide. Colombia----------**49. B. kalbreyeri.**

Disk annular.

Corolla 10–11 mm long, the tube cylindric, not ventricose; leaf blades puberulous on the lower surface. Venezuela.
50. B. clivorum.

Corolla 13 mm long or usually more, the tube ventricose; leaf blades glabrous or sparingly strigillose on the lower surface.

Peduncle 5–many-flowered, the inflorescence subcorymbose. Corolla lacking a hairy ring within.

Calyx lobes about 3 mm long, not veiny. Colombia.
51. B. decipiens.

Calyx lobes 4–10.5 mm long, conspicuously veiny.

Corolla red; calyx lobes 4–7 mm long, orbicular; leaf veins 6–8 pairs; filaments and anthers stipitate-glandular. Peru----------**52. B. tetrangularis.**

Corolla white; calyx lobes 8.5–10.5 mm long, oblong; leaf veins 11–13 pairs; androecium eglandular. So. Brazil.
95. B. selloana.

Peduncle 1–3-flowered.

Corolla with a hairy ring within; peduncles 2- or 3-flowered; leaf blades up to 20 cm long and 8.5 cm wide. Colombia.
53. B. elegans.

Corolla lacking a hairy ring within; peduncles 1-flowered; leaf blades not over 8 cm long and 2.7 cm wide. Costa Rica.
59. B. formosa.

BB. Corolla tube pilose or puberulous externally.

Ovary glabrous; peduncles much longer than the pedicels.

Corolla tube with a hairy ring within, the throat glabrous within. Calyx lobes mucronate.

Tube of corolla 8.5 mm wide at middle; calyx lobes united for about one third their length. Bolivia----------**54. B. rotundifolia.**

Tube of corolla 3.5 mm wide at middle; calyx lobes nearly free. Peru.
55. B. concolor.

Corolla tube lacking a hairy ring within, the throat stipitate-glandular within.

Corolla red; calyx lobes 4–7 mm long, rounded, prominently veiny. Peru----------**52. B. tetrangularis.**

Corolla ochroleucous; calyx lobes 3–4 mm long, acutish, submucronate, not veiny. Peru----------**56. B. pallidiflora.**

Ovary pilose; peduncles equaling or shorter than the pedicels. Corolla orange or red.
Corolla limb (15 mm) broader than the length of the tube; peduncle very short (3 mm), bearing a single pedicel. Panama---**57. B. amabilis.**
Corolla limb (9 mm or less) much shorter than the length of the tube; peduncles often longer, 1–many-flowered.
Calyx lobes suborbicular, rounded at apex, strongly imbricate.
Pedicels umbellate or subcorymbose. Costa Rica---**58. B. triflora.**
Pedicels solitary. Colombia---**58a. B. triflora var. australis.**
Calyx lobes ovate, acute, scarcely imbricate. Colombia---**10. B. nemorosa.**

3. Comosae. Pubescentia hirsuta; folia membranacea, integra; pedicellus solitarius; calycis lobi liberi, argute serrati, intus glabri; corolla coccinea, utrinque longe pilosa; ovarium glabrum; discus in glandulam posticam solitariam oblongam haud annularem reductus. Typus: *B. comosa* Morton.
A single species. Ecuador---**60. B. comosa.**

4. Mirificae. Frutices hirsuti; folia magna membranacea serrata; calycis lobi liberi subulato-mucronati; corolla lutea vel aurantiaca; ovarium glabrum; discus annularis. Typus: *B. mirifica* Morton.
A single species. Colombia---**61. B. mirifica.**

5. Mexicanae. Frutices; folia subintegra; calycis lobi lineari-lanceolati inaequales, longissimus corolla longior; discus semiannularis. Typus: *B. deflexa* (Oerst.) Hanst.
Stems and leaves strigose. Mexico---**62. B. deflexa.**
Stems and leaves hirsute. Mexico---**63. B. cyrtanthemum.**

6. Confertae. Pedunculus communis obsoletus, pedicellis in axillis aggregatis; calycis lobi fere liberi (numeris 64 et 87b exceptis), saepe acuti vel acuminati, 7.5 (6)–17 mm longi; corollae tubus calyce non duplo longior, ecalcaratus erectus, fauce contracta, limbo terminali parvo regulari; discus annularis vel semiannularis. Typus: *B. immitis* Morton.
Calyx lobes connate to middle, acuminate or filiform.
Upper leaf surface tuberculate; ovary villous. Colombia.
64. B. tuberculata.
Upper leaf surface smooth; ovary glabrous. Peru.
87b. B. peruviana var. dissimilis.
Calyx lobes free or nearly so.
Leaf blades subcoriaceous.
Calyx lobes toothed; ovary villous at apex. Corolla red-villous. Costa Rica---**65. B. columneoides.**
Calyx lobes entire; ovary glabrous.
Corolla lobes bearded.
Pubescence of stems, petioles and leaf blades appressed. Disk annular.
Petioles not over 4 cm long; leaf blades oblanceolate. Peru and Amazonian Brazil---**66. B. ignea.**
Petioles 7–10 cm long; leaf blades elliptic. Peru.
66a. B. ignea var. mexiae.
Pubescence hirsute.
Disk annular. Peru---**66b. B. ignea var. loretensis.**
Disk semiannular. Colombia---**66c. B. ignea var. semiannularis.**
Corolla lobes merely ciliolate.
Pedicels and calyx lobes densely villous. Dominica.
67. B. petiolaris.
Pedicels and calyx lobes sericeous. Costa Rica---**68. B. robusta.**

Leaf blades membranous.
Stems, petioles, and leaf blades sparingly strigose. Corolla yellow.
Corolla densely villous. Peru---69. **B. citrina.**
Corolla glabrous or only sparingly pilosulous.
Corolla glabrous. Peru---70. **B. membranacea.**
Corolla pilosulous.
Calyx lobes about 8.5 mm long; pedicels 5 mm long or less. So. Brazil---71. **B. cuneata.**
Calyx lobes 12–17 mm long; pedicels 12–17 mm long. So. Brazil---72. **B. melancholica.**
Stems, petioles, and leaf blades hirsute.
Calyx lobes pubescent on both sides.
Calyx lobes membranous, broadly ovate, 7–9 mm wide. So. Brazil. 73. **B. symphytum.**
Calyx lobes thicker, linear-lanceolate, not over 2 mm wide. Venezuela. 76. **B. disgrega.**
Calyx lobes glabrous within.
Corolla glabrous externally.
Leaf blades cuneate at base, sharply serrate; corolla yellow or orange. So. Brazil---74. **B. meridionalis.**
Leaf blades rounded at base, merely denticulate; corolla white. Peru---77. **B. furva.**
Corolla hairy externally. Leaf blades entire or nearly so (except in no. 80).
Ovary glabrous.
Calyx lobes ovate-lanceolate, 12–17 mm long; corolla whitish or pale yellow. So. Brazil---75. **B. fasciculata.**
Calyx lobes lanceolate or linear-lanceolate, 7.5–13 mm long; corolla orange.
Corolla with a hairy ring within; leaf veins not impressed above. Colombia---78. **B. riparia.**
Corolla lacking a hairy ring within; leaf veins strongly impressed above. Colombia---79. **B. impressa.**
Ovary hairy.
Corolla red, with a hairy ring within. Calyx lobes entire; leaves serrulate. Colombia and Peru---80. **B. immitis.**
Corolla lacking a hairy ring within (no. 36 might be looked for here).
Calyx lobes toothed; corolla yellow; leaf blades subentire. Peru. 81. **B. compta.**
Calyx lobes entire; corolla orange or red; leaf blades serrate. Panama---86a. **B. pauciflora** var. **uniflora.**

7. ELONGATAE. Pedunculus communis elongatus, pedicellis umbellatis vel subcorymbosis; calycis lobi liberi vel ad medium connati, saepe integri, 10–17 mm longi (7–8.5 mm in numeris 91, 96 et 97), saepe acuminati; corolla erecta ecalcarata ventricosa, fauce contracta, limbo terminali, fere regulari; discus glaber, saepe annularis. Typus: *B. elongata* Urban.
Corolla pubescent externally.
Stems and leaves hirsute.
Ovary pubescent, at least at apex; calyx lobes free.
Corolla with a hairy ring within; calyx lobes glabrous within, mucronate.
Mucro much exceeding apex of sepal; corolla long-pilose externally; leaf blades acuminate, cuneate at base, not over 13 cm long and 6 cm wide. Peru---82. **B. capitata.**

Mucro not reaching apex of sepal; corolla minutely but densely hirtopuberulous; leaf blades rounded at apex and base, 17–26 cm long, 8–15 cm wide. Peru.....**83. B. racemosa.**

Corolla lacking a hairy ring within; calyx lobes hirsute on both sides, linear-lanceolate, not mucronate. Panama to Bolivia.
86. B. pauciflora.

Ovary glabrous; calyx lobes united to middle. Peru.....**87. B. peruviana.**

Stems and leaves strigillose. Ovary glabrous; calyx lobes united to middle. Bolivia.....**85. B. ovalifolia.**

Corolla glabrous externally.

Ovary pubescent.

Leaf blades elevated and strongly reticulate beneath; disk semiannular or reduced to a posterior gland.

Outer calyx lobe much longer and broader than the others. Colombia.
98. B. heterosepala.

Outer calyx lobe conform with the others. Colombia.
99. B. subcarnosa.

Leaf veins not strongly elevated or reticulate; disk annular. So. Brazil.
96. B. grandifolia.

Ovary glabrous.

Calyx lobes united to middle, long-acuminate.

Stems and leaves hirsute.

Peduncles shorter than the petioles or pedicels. French Guiana.
88. B. patrisii.

Peduncles much longer than the petioles or pedicels. Peru.
87a. B. peruviana var. occulta.

Stems and leaves appressed-pubescent.

Corolla limb slightly bilabiate, 15–16 mm wide. Bolivia.
100. B. longipedunculata.

Corolla limb regular, 6–11 mm wide.

Leaf blades serrate. British Guiana.....**89. B. verecunda.**

Leaf blades subentire or merely denticulate. Peru.
90. B. divaricata.

Calyx lobes free or united only near base.

Stems and leaves hirsute-tomentose; corolla lobes long-ciliate. Peru.
84. B. trichiata.

Stems and leaves puberulous or glabrate; corolla lobes glabrous or ciliolate.

Calyx lobes suborbicular, lacking a midrib. Venezuela.
97. B. rhytidophyllum.

Calyx lobes oblong, ovate-lanceolate, or lanceolate, the midrib usually prominent.

Leaf blades, peduncles, and pedicels entirely glabrous at maturity. Corolla yellow. Costa Rica.....**92. B. macropoda.**

Leaf blades, peduncles and pedicels at least slightly puberulous.

Corolla orange or red; leaf blades with 5–8 (rarely 10) pairs of lateral veins. Mexico to South America.....**91. B. laxiflora.**

Corolla white or yellow; lateral veins 7–13 pairs.

Calyx lobes acuminate or acute.

Leaf blades toothed. St. Vincent.....**93. B. elongata.**

Leaf blades entire. So. Brazil.....**94. B. umbrosa.**

Calyx lobes rounded. Corolla white. So. Brazil.
95. B. selloana.

8. TYPICAE. Folia serrata, ovata vel elliptico-oblonga, membranacea, subtus strigillosa vel glabrata; pedunculus communis obsoletus, pedicellis paucis axillaribus; calyx cylindricus vel urceolatus, lobis alte connatis integris acutis; corolla lutea vel ochroleuca, erecta ecalcarata ventricosa, fauce contracta, limbo terminali regulari; gynaeceum glabrum; discus annularis glaber. Typus: *B. lutea* L.

Calyx urceolate, glabrate or strigillose. West Indies.....**101. B. lutea.**

Calyx cylindric, hirto-puberulous. British and French Guiana.

102. B. insolita.

Section II. NEOBESLERIA Morton, sect. nov.

Herbae vel frutices, caulibus lanato-tomentosis vel strigillosis raro hirsutis; folia opposita, saepe serrata acuminata membranacea; pedunculus communis saepe elongatus; calycis lobi liberi, saepe dentati; corolla horizontalis postice calcarata; discus saepe postice crassior, saepe pubescens. Typus: *B. corallina* Fritsch.

KEY TO SUBSECTIONS

Common peduncle elongate, much exceeding the pedicels in length.

Corolla limb not spotted.

Disk not thickened posteriorly, glabrous.....9. PENDULAE.

Disk thickened posteriorly, or reduced to a posterior gland, pubescent (except in *B. corallinoides*).

Corolla scarlet, contracted in throat; ovary glabrous; calyx lobes strongly imbricate.

Calyx lobes toothed, pubescent on both sides; corolla puberulous or pilosulous externally; leaf blades strongly toothed..10. CORALLINAE.

Calyx lobes entire, glabrous; corolla glabrous; leaf blades entire or denticulate (except in *B. imbricans* var. *arguta*.)..11. IMBRICATAE.

Corolla yellow, not contracted in throat; ovary pubescent; calyx lobes slightly imbricate.....12. WENDLANDIANAE.

Corolla limb purple-spotted.....13. MACULATAE.

Common peduncle obsolete.

Corolla limb regular, not over 10 mm wide; ovary glabrous; pubescence appressed.....14. AXILLARES.

Corolla limb bilabiate, 35 mm wide; ovary pilose; pubescence hirsute

15. HERBACEAE.

9. PENDULAE. Caules sericeo-strigosi; folia subintegra vel parum denticulata, venis 4–9-jugis; pedunculus communis pendulus (*B. floribunda* excepta), pedicellis multo brevioribus; calycis lobi liberi integri utrinque plus minusve pilosuli; corolla flava calcarata horizontalis, fauce non contracta, limbo terminali subregulari; ovarium pubescens; discus annularis glaber. Typus: *B. penduliflora* Fritsch.

Common peduncle erect. Calyx lobes pilosulous in a median line. Colombia.

103. B. floribunda.

Common penduncle pendulous, very slender.

Calyx lobes pilosulous over the whole surface; corolla 35–40 mm long; leaf blades densely hairy on both surfaces. Venezuela.

104. B. penduliflora.

Calyx lobes pilosulous only at base; corolla 17–24 mm long; leaf blades sparingly strigose. Venezuela.....**105. B. pendula.**

10. CORALLINAE. Caules dense tomentosi; folia serrata vel crenata, venis 9–11-jugis; pedunculus communis erectus, pedicellis multo brevioribus; calycis lobi liberi ovati imbricati serrati vel denticulati, utrinque pubescentes; corolla coccinea

horizontalis calcarata pubescens, fauce contracta, limbo terminali parvo regulari; ovarium glabrum; discus postice crassior saepe pubescens. Typus: *B. corallina* Fritsch.

Disk gland glabrous; filaments and anthers slightly pilose; corolla only slightly spurred. Ecuador.....**107. B. corallinoides.**

Disk gland puberulous or pilosulous; androecium glabrous; corolla strongly spurred at base.

Calyx lobes incised-serrate. Peru.....**106. B. corallina.**

Calyx lobes merely denticulate.

Calyx lobes 5.5 mm long; leaf blades serrate, appressed-pubescent on the veins beneath. Colombia.....**108. B. sylvarum.**

Calyx lobes 7–9 mm long; leaf blades crenate, hirsute on the veins beneath. Colombia.....**109. B. crenata.**

11. Imbricatae. Frutices, caulibus minute puberulis, mox glabris; folia saepe subintegra, venis 14–17-jugis; pedunculus communis elongatus, pedicellis multo brevioribus; calycis lobi liberi imbricati inaequales integri glabri; corolla coccinea horizontalis calcarata glabra, fauce contracta, limbo terminali parvo regulari; ovarium glabrum; discus postice crassior pubescens. Typus: *B. imbricans* Donn. Smith.

Leaf blades rounded at base and toward apex, the apex itself short-cuspidate; corolla 3 cm long or more, the spur 8 mm long; calyx lobes about 14 mm long. Panama.....**110. B. panamensis.**

Leaf blades acute at base and apex; corolla 1.5 cm long, the spur 1.2–2.5 mm long; calyx lobes 7–10 mm long.

Blades entire; corolla spur not hooked. Costa Rica.....**111. B. imbricans.**

Blades serrate; corolla spur a little hooked. Costa Rica.
111a. B. imbricans var. arguta.

12. Wendlandianae. Frutices, caulibus tomentosis vel strigillosis; folia serrata vel parum denticulata, appresso-pubescentia; pedunculus communis elongatus, pedicellis multo brevioribus; calycis lobi liberi acuminati serrati non imbricati; corolla flava horizontalis calcarata externe parce pilosula, fauce non contracta, limbo terminali regulari parvo non purpureo-maculato; ovarium pubescens; discus postice crassior pubescens. Typus: *B. wendlandiana* Hanst.

Corolla tube not ventricose, the spur short; common peduncle pubescent. Leaf blades serrate. Costa Rica.....**112. B. wendlandiana.**

Corolla tube strongly ventricose; peduncles glabrous.

Corolla spur about 3 mm long; leaf blades merely denticulate. Colombia.
113. B. columbiana.

Corolla spur about 6 mm long; leaf blades sharply serrate. Colombia.
113a. B. columbiana var. arguta.

13. Maculatae. Frutices, caulibus tomentosis vel strigillosis; folia serrata, venis 8–15-jugis; pedunculus communis elongatus, pedicellis multo brevioribus; calycis lobi liberi acuminati intus glabri; corolla flava et purpureo-maculata, horizontalis, calcarata, fauce non contracta, limbo bilabiato; discus postice crassior pubescens. Typus: *B. rupestris* Morton.

Stems densely lanate-tomentose; calyx lobes toothed; ovary villous. Colombia, Ecuador & Peru.....**114. B. rupestris.**

Stems sparsely strigillose; calyx lobes entire; ovary glabrous. Costa Rica.
115. B. acropoda.

14. Axillares. Herbae, caulibus strigillosis; folia denticulata strigillosa, venis 9-jugis; pedunculus communis obsoletus, pedicellis axillaribus; calycis lobi liberi oblongi integri non imbricati; corolla horizontalis, calcarata, fauce contracta, limbo terminali parvo regulari; ovarium glabrum; discus postice crassior glaber. Typus: *B. gibbosa* (Poepp.) Hanst.

Corolla white or yellow; ovary glabrous; disk thickened posteriorly.
Calyx lobes glabrous within; corolla white, 24–30 mm long. Amazonian Brazil.....116. **B. gibbosa.**
Calyx lobes puberulous on both sides; corolla yellow, about 16 mm long. Guatemala.....117. **B. flava.**
Corolla scarlet; ovary pubescent; disk annular, regular. Ecuador.
6. B. miniata.

15. Herbaceae. Herbae parvae, caulibus hirsutis; folia serrata hirsuta; pedunculus communis obsoletus, pedicello solitario axillari; calycis lobi liberi integri; corolla alba horizontalis calcarata externe pilosula, tubo deflexo, fauce ampliata, limbo terminali 25 mm lato bilabiato; ovarium pilosum; discus postice crassior pubescens. Typus: *B. herbacea* Morton.

A single species. Colombia.....118. **B. herbacea.**

Section III. RHYNCHOBESLERIA (Hanst.) Benth. & Hook.

Caules saepe appresso-pubescentes; folia saepe dentata; pedunculus communis nullus vel obsoletus; calycis lobi liberi; corollae tubus sursum ampliatus, fauce non contracta, limbo terminali bilabiato 16–35 mm lato; ovarium saepe pubescens; discus glaber. Typus: *B. labiosa* Hanst.

KEY TO SUBSECTIONS

Disk reduced to a bilobed posterior gland; leaf blades linear-lanceolate, 7–15 mm wide.....16. Salicifoliae.
Disk annular (semiannular in *B. longipes*); leaf blades oblong to broadly elliptic.
Common peduncle none, the pedicels solitary; leaf blades not pellucid-punctate.....17. Solitariae.
Common peduncle vestigial, the pedicels 2–4 in the axils; leaf blades often pellucid-punctate.....18. Labiatae.

16. Salicifoliae. Herba appresso-pubescens; folia lineari-lanceolata, integra, venis 3–5-jugis; pedunculus communis obsoletus, pedicellis solitariis vel binis; calycis lobi lineari-lanceolati integri; corolla externe pilosula, intus basin versus annulum pilosum gerens; filamenta basi pilosa; ovarium pilosum; discus in glanduiam bilobam reductus. Typus: *B. salicifolia* Fritsch.

A single species. Colombia.....119. **B. salicifolia**

17. Solitariae. Folia elliptica, strigosa vel hirsuta; pedunculus communis nullus, pedicellis solitariis; calycis lobi ovati vel lanceolati, saepe serrati. Typus: *B. princeps* Hanst.

Leaf blades entire, tuberculate above, hirsute; corolla with a hairy ring within near base; filaments and anthers pilosulous. Costa Rica.
120. B. princeps.
Leaf blades serrate, not tuberculate, strigose; corolla lacking a hairy ring within; androecium glabrous.
Calyx lobes serrate; corolla orange; leaf veins 12 or 13 pairs. Costa Rica.
121. B. barbensis.
Calyx lobes entire; corolla white; leaf veins 4 or 5 pairs. Tobago.
122. B. seitzii.

18. Labiatae. Caules glabri vel appresso-pubescentes; folia elliptico-oblonga vel oblongo-ovata, integra vel serrata vel dentata, opaca vel pellucido-punctata, venis 4–12-jugis; pedunculus communis obsoletus, pedicellis 2–4 axillaribus; calycis lobi integri vel undulati; corolla rubra vel flava, 20–40 mm longa, utrinque glabra; ovarium glabrum vel pubescens. Typus: *B. labiosa* Hanst.

Leaf blades membranous, pellucid-punctate, toothed; corolla yellow, 35–40 mm long.
Calyx lobes suborbicular, 8–9 mm long. Venezuela.....**125. B. labiosa.**
Calyx lobes oblong-lanceolate, 15–18 mm long. Trinidad...**124. B. longipes.**
Leaf blades coriaceous, opaque, entire; corolla orange-red, 20 mm long. Colombia.
123. B. crassa.

Section IV. GASTERANTHUS (Benth.) Benth. & Hook.

Herbae vel frutices; folia saepissime serrata vel dentata; pedunculus communis elongatus, vel raro obsoletus, uniflorus vel saepe multiflorus; calycis lobi ovati vel lanceolati, interdum utrinque pubescentes; corolla saepe calcarata, ventricosa, saepe pubescens, limbo laterali haud terminali; ovarium saepissime plus minusve pubescens; discus postice crassior vel in glandulam posticam reductus, glaber vel pubescens. Typus: *B. quitensis* (Benth.) Hanst.

Corolla not spurred, erect in calyx; leaves subrosulate.....**137. B. anomala.**
Corolla spurred, horizontal in calyx; leaves subremote, strictly opposite.
Pedicels solitary.
Filaments puberulous; leaf blades linear-oblong, not over 1.8 cm wide, sinuate-dentate; peduncle and pedicel glabrous. Ecuador.
134. B. perennis.
Filaments glabrous; leaf blades obovate-oblong, at least 4 cm wide, serrate; peduncle and pedicel canescent or tomentose.
Stems closely canescent. Guatemala.....**135. B. pansamalana.**
Stems tomentose. Ecuador.....**136. B. ecuadorensis.**
Pedicels umbellate or subcorymbose.
Disk glabrous.
Stems and leaves hirsute; leaf blades serrate; calyx lobes denticulate.
Calyx lobes hirsute, 5–7 mm long; leaf blades hirsute on the upper surface. Colombia and Ecuador.....**126. B. calcarata.**
Calyx lobes glabrate, about 10 mm long; leaf blades glabrate on the upper surface. Ecuador.....**127. B. quitensis.**
Stems and leaves tomentose or strigillose; leaf blades dentate; calyx lobes entire. Ecuador.....**128. B. calceolus.**
Disk pubescent.
Corolla orange, long-pilose. Ecuador.....**129. B. timida.**
Corolla scarlet, glabrous or minutely puberulous.
Ovary strongly compressed, pilosulous on the margins; leaf blades rounded at apex; young stems, peduncles, calyx lobes, and leaf veins beneath villous-tomentose. Corolla 35 mm long. Ecuador.
130. B. venusta.
Ovary not compressed, puberulous all over or glabrous; leaf blades acuminate at apex; stems, peduncles, calyx lobes, and leaf veins lanate-tomentose or merely strigillose.
Peduncles 16–17 cm long; ovary entirely glabrous; corolla 30–35 mm long. Ecuador.....**131. B. lateralis.**
Peduncles 3–7 cm long; ovary puberulous; corolla 17–22 mm long.
Calyx lobes 4–6 mm long, rounded. Ecuador.
132. B. oncogastra.
Calyx lobes 6.5–9 mm long, acuminate. Colombia.
133. B. tincta.

1. Besleria solanoides H. B. K. Nov. Gen. & Sp. **2**: 398. 1818.

Besleria acutifolia Benth. Plant. Hartw. 237. 1846.

Parabesleria costaricensis Oersted, Centralamer. Gesn. 53. *pl. 6, fig. 9–13.* 1858.

Besleria costaricensis Hanst. Linnaea **34**: 330. 1865.

Shrub 1.5–3 m high; stems strigose upwardly, almost glabrous below; petioles 5 cm long or less; leaf blades elliptic, up to 15 cm long and 5.5 cm wide, cuneate at base, inconspicuously denticulate, strigillose on the veins beneath, otherwise glabrous or nearly so, the primary veins 6–8 pairs; pedicels few, up to 2 cm long; calyx lobes oblong, 3–4 mm long, obtuse, free, membranous, not concave, faintly nerved, nearly glabrous, ciliolate; corolla orange, 13–15 mm long, erect, not calcarate or saccate at base, ventricose upwardly, glabrous externally, lacking a hairy ring within; androecium glabrous; ovary and style glabrous; disk entire; berry orange.

TYPE: Popayán, Dept. El Cauca, Colombia, *Humboldt & Bonpland* (B).

RANGE: Honduras to Peru, and West Indies.

ADDITIONAL SPECIMENS EXAMINED:

HONDURAS: El Achote, *Yuncker, Dawson & Youse* 6245 (F, S).

COSTA RICA: *Oersted* (Co), type of *B. costaricensis.* Santa María de Dota, Prov. San José, *Standley* 41749 (F, W), 41840 (W), 42416 (W); *Stork* 3015 (F). Los Ayotes, Prov. Guanacaste, *Standley & Valerio* 45367 (W). La Ventolera, on Volcán de Poás, Prov. Alajuela, *Standley* 34738 (W). Irazú, Prov. San José, *Pittier* 13041 (K). Naranjo Prov. Alajuela, *Stork* 1844 (F).

PANAMA: El Boquete, Chiriquí, *Maxon* 4953 (F, W); *Pittier* 2972 (W).

JAMAICA: *Wright* (K).

DOMINICA: *Anderson* (K).

VENEZUELA: Mérida, *Moritz* 1491 (B).

COLOMBIA: Without specific locality, *Linden* 1114 (K); *Triana* s. n. (K). SANTANDER: Vicinity of El Roble, *Killip & Smith* 19371 (W). BOYACÁ: Caldas, *Dawe* 785 (K, W, Y); Mount Chapón, *Lawrance* 262 (B, F, K, S, W). TOLIMA: Medación, *André* 2056 (K); Libano, *Pennell* 3400 (Y). ANTIOQUIA: Titiribí, vicinity of Medellín, *Toro* 502 (Y); Angelopolis, *Toro* 902 (Y); Fredonia, *Toro* 851 (Y); Armeria, *Toro* 225 (Y); Sousón, *Lopez* (*Archer* 398, W); Santa Elena, *Archer* 634 (W). CALDAS: Canaan, south of Salerito, *Pennell* 9077 (G, P, W, Y). EL VALLE: Between Las Hojas and Río Dagua, *Triana* 2467 (B, K, W); hills of Miraflores, above Palmira, *Pittier* 899 (W); La Cumbre, *Killip & Hazen* 11119 (P, W); Miraflores, Palmira, *Killip* 6129 (Y), 6145 (P, W, Y). EL CAUCA: La Gallera, Micay Valley, *Killip* 7900 (P, Y); plateau of Popayán, *Lehmann* 4947 (F, G, K, W), 4761 (K); *André* K 1496 (K, Y); *Hartweg* 1276 (K), type of *B. acutifolia;* Río Ortega, north of Tambo, *Pennell & Killip* 8065 (P). El Tambo, *Sneidern* 592 (S), 898 (S).

PERU: Tambillo, *Jelski* 24 (B).

1a. Besleria solanoides var. **tenera** Morton, Field Mus. Publ. Bot. **18**: 1155. 1938.

Differs from the typical variety in the slightly puberulous corolla and in the pilose ovary.

TYPE: Cerro de La Carpintera, Prov. Cartago, Costa Rica, altitude 1,500–1,850 meters, *Standley* 35554 (W).

RANGE: Costa Rica and Colombia, at 1,400 to 1,850 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Type locality, *Standley* 34394 (W). Estrella, Prov. Cartago, *Cooper* 5879 (G, K, W).

COLOMBIA: Quindío, *Goudot* (K). Without specific locality, *W. Bull* (K).

1b. Besleria solanoides var. parvifolia Morton, var. nov.

A var. *typica* foliis multo minoribus (3.5–9 cm longis, 1–2 cm latis), caulibus scabriusculis differt.

Differs from the typical variety in the much smaller leaf blades (3.5–9 cm long, 1–2 cm wide) and in the subscabrous stems.

Type in the Gray Herbarium, collected in highlands of Popayán, Department of El Cauca, Colombia, altitude 1,600–1,900 meters, February 1886, by F. C. Lehmann (no. B. T. 1075). Duplicates at Kew and the Field Museum.

RANGE: Southern Colombia, at 1,500 to 2,000 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Popayán, *Lehmann* B. T. 674 (K, Y).

2. Besleria lehmannii Fritsch, Notizbl. Bot. Gart. Berlin **11**: 967. 1934.

Shrub up to 3 m high; stems substrigose at apex, soon glabrate; petioles about 1 cm long; leaf blades narrowly elliptic, 7–10 cm long, 3–4 cm wide, cuneate at base, inconspicuously denticulate, strigillose beneath, the primary veins about 7 pairs; pedicels few, up to 2 cm long; calyx lobes ovate, about 4 mm long, nearly free, rounded, coriaceous, entire, strigillose, ciliolate; corolla orange-scarlet, about 12 mm long, erect, not spurred or saccate, almost cylindric, the tube about 3 mm wide, glabrous, lacking a hairy ring within; androecium glabrous; ovary and style glabrous; disk annular.

TYPE: Cordillera de Belalcazar, Dept. El Cauca, Colombia, *Lehmann* 7217 (B).

RANGE: Southern Colombia, at 1,200 to 1,600 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Type collection (K, W).

3. Besleria delvillari Cuatr. Trab. Mus. Cienc. Nat. & Jard. Bot. Madrid, Bot. **29**: 11. 1935.

Stems sericeous at apex, glabrate below; petioles up to 15 mm long; leaf blades elliptic, about 8 cm long and 3.5 cm wide, membranous, cuneate at base, entire, puberulous on the veins beneath, the primary veins about 7 pairs; pedicels few, 1 cm long or less; calyx lobes suborbicular, about 5.5 mm long, much imbricate, united toward base, membranous, entire, rounded, not mucronate, venose, strigillose externally, ciliolate; corolla 15–17 mm long, erect, not saccate at base, the tube 6–8 mm wide, ventricose upwardly, glabrous, lacking a hairy ring within; ovary and style pilosulous.

TYPE: Cuesta del Sacrificio, Nevada del Tolima, Dept. Tolima, Colombia, *Cuatrecasas* 2048.

RANGE: Colombia, at 2,100 meters elevation.

SPECIMENS EXAMINED: Type collection (B, F).

A critical species, without any very distinctive characters. It differs from *B. acutifolia* in its pubescent ovary and broader corollas.

4. Besleria modica Morton, Proc. Biol. Soc. Washington **48**: 58. 1935.

Shrub; stems densely strigose; petioles strigose, up to 4 cm long; leaf blades elliptic, up to 10 cm long and 4.5 cm wide, cuneate at base, entire (the margin revolute), subtomentose, strigillose on the veins beneath, the primary veins about 5 pairs; pedicels numerous, about 1 cm long; calyx lobes connate at base, oval, about 4 mm long, rounded, venose, strigillose externally; corolla reddish, 9–10 mm long, erect, not spurred, the tube inflated, essentially glabrous without, lacking a hairy ring within; ovary and style puberulous; disk annular.

TYPE: Zaruma, Province of Oro, Ecuador, *Hitchcock* 21201(W).

RANGE: Ecuador, at 1,000 to 2,550 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Saloya Valley, Quito, *Diels* 838 (B).

5. Besleria microphylla Fritsch, Repert. Sp. Nov. Fedde **18**: 8. 1922.

Herb or shrub; stems densely appressed-pilose; petioles 1 to 10 (rarely 40) mm long; leaf blades oblanceolate, usually very small and not over 4.5 cm long

and 1 cm wide, but sometimes up to 10 cm long and 3.4 cm wide, attenuate at base, entire, membranous, strigose beneath on veins, the primary veins about 5 pairs (rarely 8); pedicels few, 5 mm long or less; calyx lobes lanceolate, 4–5 mm long, equal, acuminate, entire, not conspicuously venose, strigose externally, glabrous within; corolla orange, 12–14 mm long, erect, slightly saccate at base, a little ventricose upwardly, sparsely pilosulous externally, lacking a hairy ring within; limb small, regular; androecium glabrous; ovary and style puberulous; stigma bilobed; disk glabrous, annular.

TYPE: Albejoral, Dept. Antioquia, *Lehmann* 4639 (B).

RANGE: Colombia and Ecuador, at 1,600 to 2,500 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COLOMBIA: Angelopolis, vicinity of Medellín, Dept. Antioquia, *Toro* 906 (Y). Buenos Aires, north of Supía, Dept. Caldas, *Pennell* 10741 (P). Alto de Taizá, Dept. El Cauca, *Lehmann* 3210 (W).

ECUADOR: Tandacato, Prov. Pichincha, *Holmgren* 464 (S); *Heilborn* 479 (S).

The specimens from Ecuador are atypical.

5a. Besleria microphylla var. serrulata Morton, var. nov.

A var. *typica* calycis lobis majoribus (ca. 7 mm longis) serrulatis, magis venosis, plus minusve inaequalibus differt.

Differs from the typical variety in the larger (7 mm long), serrulate, more veiny, more or less unequal calyx lobes.

Type in the New York Botanical Garden, collected at Cascada Chorrón, south of Antizales, Department of Bolivar, Colombia, altitude 2,400–2,700 meters, Feb. 25, 1918, by F. W. Pennell (no. 4382).

RANGE: Colombia.

ADDITIONAL SPECIMEN EXAMINED: Dauro, vicinity of Medellín, Dept. Antioquia, *Toro* 1156 (Y).

6. Besleria miniata Morton, sp. nov.

Caules quadrangulari strigillosi; petioli breves strigillosi; lamina foliorum elliptico-lanceolata membranacea integra, subtus in venis strigillosa; pedicelli pauci, breves, patentes vel deflexi, strigillosi; calycis lobi ovales rotundati membranacei integri, fere glabri, albo-ciliati, non mucronati; corolla coccinea horizontalis, paullo calcarata, sursum paullo ventricosa, externe parce pilosa, fauce contracta, lobis parvis aequalibus; ovarium pilosulum; discus annularis; bacca alba.

Shrub up to 3.5 m high, the stems quadrangular, strigillose toward apex, glabrate below; petioles strigillose, up to 1.2 cm long; leaf blades elliptic-lanceolate, 10–12 cm long, 3–4 cm wide, cuneate at base, membranous, entire, glabrous above, strigillose beneath on the veins, the primary veins 4 pairs; common peduncle obsolete, the pedicels few, about 1 cm long, spreading or deflexed, sparingly strigillose; calyx lobes free, oval, 3.5 mm long, 2 mm wide, rounded at apex, not mucronate, thin-membranous, entire, almost glabrous externally, glabrous within, conspicuously white-ciliate; corolla scarlet, about 15 mm long, horizontal in calyx, short-spurred at base (the spur rounded, 2–2.5 mm long), the tube 3 mm wide, upwardly a little ventricose, becoming 4 mm wide, externally with a few scattered hairs, lacking a hairy ring within, the throat a little contracted, the limb terminal, narrow, the lobes small, equal, scarcely 1 mm long; androecium glabrous; ovary pilosulous; style glabrous; disk annular, irregularly lobed, glabrous; berry white, about 7 mm in diameter.

Type in the U. S. National Herbarium, no. 1,705,126, collected at Parroquia de Concepción, Province of Esmeraldas, Ecuador, altitude 105 meters, Dec. 7, 1936, by Ynes Mexía (no. 8410).

7. Besleria pennellii Morton, sp. nov.

Suffrutex, caulibus novellis dense pilosulis; petioli substrigosi; lamina foliorum elliptica, integra, basi cuneata, supra strigosa, subtus praecipue in venis dense flavido-strigosa; pedicelli pauci breves pilosuli; calycis lobi oblongi integri aequales, fere liberi, apice rotundati, non mucronati, externe dense strigosi; corolla aurantiaca, erecta, ecalcarata, externe densissime pilosa, non ventricosa, lobis parvis, paullo inaequalibus, pilosis; ovarium pilosum; discus annularis; bacca parva.

Small, scarcely branched shrub, the stems densely short-pilose upwardly, glabrate below; petioles substrigose, up to 2 cm long; leaf blades elliptic, up to 6.3 cm long and 2.5 cm wide, or probably becoming somewhat larger, acute at apex, cuneate at base, entire, strigose above, densely yellowish-strigose beneath, especially on veins; primary veins 7 or 8 pairs; common peduncle obsolete, the pedicels 2–5, pilosulous, 6–10 mm long; calyx lobes oblong, 4.2 mm long, 2 mm wide, equal, almost free, erect, entire, rounded, not mucronate, densely strigose externally, glabrous within; corolla orange, 10–13 mm long, erect in the calyx, not spurred at base, the tube about 5 mm wide, densely pilose externally, glabrous within, not ventricose, the throat hardly contracted, the limb terminal, about 7 mm wide, the lobes small, externally pilose, glabrous and eglandular within, a little unequal, the two posterior 2 mm long, the others 2.5 mm long; androecium glabrous; ovary pilosulous; style glabrous; disk annular, thin, glabrous; berry globose, small, hardly 4 mm in diameter, pilose at apex, the style base persistent.

Type in the Academy of Natural Sciences, Philadelphia, no. 642569, collected on Cerro Tatamá, Department of Caldas, Colombia, altitude 3,200–3,400 meters, Sept. 8–10, 1922, by F. W. Pennell (no. 10487).

During his explorations in Colombia the collector of the present species, who devoted special attention to the Gesneriaceae, made accurate color notes, which are in many cases of great value. I am indebted to him for the loan of almost the entire collection of Gesneriaceae in the Academy of Sciences. *Besleria pennellii* is probably found at the highest altitude of any species of the genus.

8. Besleria angustiflora Fritsch, Notizbl. Bot. Gart. Berlin **11**:966. 1934.

Tall herb, with slender stems, puberulous toward apex; petioles up to 2 cm long; leaf blades oblanceolate, 15 cm long and 5 cm wide, coriaceous or thick-chartaceous, attenuate at base, entire, strongly discolorous, minutely strigillose on both surfaces, the primary veins 8–10 pairs; pedicels few or numerous, up to 2 cm long; calyx lobes coriaceous, ovate, 3–3.5 mm long, rounded or acutish, glabrous or nearly so, ciliolate, not venose; corolla orange, 12–14 mm long, erect, scarcely ventricose, the tube slender, not over 3 mm wide, glabrous without, sparsely pilosulous within but lacking a hairy annulus, the limb narrow, regular; androecium glabrous; ovary and style strigillose; disk glabrous, annular.

TYPE: Popayán, Dept. El Cauca, Colombia, *Lehmann* 5129 (B).

RANGE: Southern Colombia, at 1,400 to 2,700 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (F, K, W). San José, Dept. El Cauca, *Pennell & Killip* 12132 (P, W, Y). La Paz, Dept. El Cauca, *Lehmann* 9993 (K, W).

9. Besleria gracilenta Morton, sp. nov.

Caules fere omnino glabri, pilis microscopicis sparse instructi; petioli breves glabri; lamina foliorum anguste lanceolata, apice gradatim acuminata, basi cuneata, chartacea, integra, fere omnino glabra; pedicelli pauci glabri; calycis lobi suborbiculares, basi connati, rotundati, non mucronati, paullo erosi, glaberrimi, minute ciliolati; corolla aurantiaca erecta ecalcarata, utrinque glabra, paullo ventricosa, lobis parvis, paullo inaequalibus; ovarium glabrum; discus annularis.

Shrub 2 m high, the stems appearing entirely glabrous even when young, a few minute hairs visible at the nodes with high magnification; petioles short, up to 15 mm long, glabrous; leaf blades narrowly lanceolate, up to 11 cm long and 2.3 cm wide, gradually acuminate at apex, cuneate at base, entire, almost glabrous, the primary veins 7–9 pairs; common peduncle nearly obsolete, becoming 1.5 mm long, the pedicels 2 or 3, about 1.5 cm long, glabrous; calyx lobes suborbicular, about 5 mm long, connate at base for 2 mm, rounded, not mucronate, a little erose, entirely glabrous, except the minutely ciliolate margin; corolla orange, 13 mm long, erect, not spurred, the tube 3.5–5 mm wide, entirely glabrous externally, lacking a hairy ring within, a little ventricose upwardly, the throat contracted, the limb terminal, narrow, the lobes small, slightly unequal; androecium glabrous; ovary and style glabrous; disk annular, glabrous.

Type in the Gray Herbarium, collected at Mirador, Province of Huánuco, Peru, altitude 2,400 meters, Nov. 5, 1935, by Ynes Mexía (no. 04136).

10. Besleria nemorosa Morton, sp. nov.

Caules apicem versus strigosi, mox glabri; petioli dense appresso-tomentosi; lamina foliorum oblanceolata, basi cuneata, membranacea, integra, subtus in venis subtomentosa; pedunculus communis brevis vel obsoletus, strigillosus, pedicellis paucis, quam pedunculo multo longioribus; calycis lobi ovati, fere liberi, membranacei, acuti, vix mucronati, integri, venosi, strigillosi; corolla erecta ecalcarata, sursum ventricosa, parce pilosula, limbo angusto, lobis subaequalibus; ovarium pilosum; discus annularis.

Stems quadrangular, about 3.5 mm thick, strigose when young, soon glabrate; petioles up to 2 cm long, densely sublanate-tomentose; leaf blades oblanceolate, up to 21 cm long and 7 cm wide, usually smaller, cuneate at base, membranous, entire, glabrous above, subtomentose on the veins beneath, the primary veins 6–8 pairs; common peduncle short (13 mm) or sometimes obsolete, strigillose, the pedicels 2–6, much longer than the peduncle, 2–3 cm long, strigillose, thickened at apex; calyx lobes ovate, 6–6.5 mm long, nearly free, membranous, colored, acute, scarcely mucronate, entire, venose, strigillose externally, glabrous within; corolla 17 mm long, erect, not spurred, a little saccate at base posteriorly, the tube 5–6 mm wide, upwardly ventricose, sparsely pilosulous externally, bearing a puberulous ring within near base, the throat contracted, the limb terminal, about 7 mm wide, the lobes subequal, ciliate; androecium glabrous; ovary and style pilose; disk annular, glabrous.

Type in the herbarium of the Naturhistoriska Rijksmuseet, Stockholm, collected in woods at Munchique, Province of El Tambo, Department of El Cauca, Colombia, altitude 2,000 meters, Aug. 27, 1935, by Kjell von Sneidern (no. 474).

RANGE: Southern Colombia, at 2,000 to 2,300 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Type locality, *Sneidern* 728 (S).

11. Besleria leucocarpa Morton, sp. nov.

Caules quadrangulares, novelli strigillosi, vetusti glabri nitidi; petioli elongati crassi strigillosi; lamina foliorum late elliptica vel oblonga, membranacea, integra vel remote denticulata, subtus strigillosa; pedicelli breves strigillosi; calycis lobi suborbiculares liberi puberuli integri rotundati venosi; corolla aurantiaco-rubra erecta ecalcarata puberula, vix ventricosa, lobis patulis parvis; ovarium puberulum; discus annularis; bacca alba.

Herb, the stems quadrangular, strigillose when young, glabrous and shining with age; petioles up to 6.5 cm long, thick, strigillose; leaf blades broadly elliptic or oblong, the largest 28 cm long and 12 cm wide, membranous, entire or remotely denticulate, short-acuminate at apex, cuneate at base, above with a few scattered appressed hairs, beneath strigillose, the primary veins 8–12 pairs; common peduncle obsolete, the pedicels numerous, about 1 cm long, strigillose; calyx

lobes suborbicular, 5 mm long, free, puberulous, entire, rounded, venose; corolla orange-red, 16 mm long, erect, not spurred, puberulous externally, bearing a hairy ring within at insertion of stamens, the tube 6.5 mm wide, scarcely ventricose, the throat somewhat enlarged, the lobes small, spreading; ovary puberulous; disk annular, thick, glabrous; berry white, pubescent, the style base persistent.

Type in the U. S. National Herbarium, no 1,142,396, collected in forest at La Gallera, Micay Valley, Cordillera Occidental, Department of El Cauca, Colombia, altitude 1,400–1,500 meters, June 29–30, 1922, by E. P. Killip (no. 7686).

ADDITIONAL SPECIMENS EXAMINED: Type collection (P, Y).

12. Besleria pycnosuzygia Donn. Smith, Bot. Gaz. 52:53. 1911.

Epiphytic shrub, the stems unbranched, strigillose at apex; leaves subequal, petiolate, the petiole up to 2 cm long, the blades oblanceolate, up to 14 cm long and 5 cm wide, acuminate at apex, attenuate at base, subcoriaceous, entire, green above, pale beneath, glabrous above, minutely and sparsely strigillose beneath; flowers fasciculate, the pedicels up to 1 cm long, strigose, the bracts small, oblong; calyx lobes oblong, 7 mm long, erect, obtuse, entire, puberulous externally, pilose within near middle; corolla scarlet, 21–24 mm long, erect in calyx, gibbous at base, long-pilose externally, glandular-pilose within toward base, the tube curved, scarcely ampliate or ventricose, slightly contracted in throat, the limb narrow, about 5 mm wide, regular, the lobes minute; anthers transversely oblong, 1 mm long, 2 mm broad, connate in pairs, the cells not confluent; ovary villous; disk annular, thick, glabrous, slightly interrupted dorsally.

TYPE: La Palma, Prov. San José, Costa Rica, *Tonduz* 12545 (W).

RANGE: Known only from type locality, at about 1,500 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Type locality, *Tonduz* 12458 (W).

The anther cells are apparently not confluent at apex, thus contradicting one of the principal generic characters of *Besleria*. Habitally, however, it is quite typical of the genus.

13. Besleria densiflora Fritsch, Notizbl. Bot. Gart. Berlin 11:965. 1934.

Stems densely strigose-subtomentose; petioles thick, 2–5 cm long; leaf blades oblanceolate, up to 25 cm long and 10 cm wide, coriaceous, entire, sericeous-strigose on costa and veins beneath, the primary veins 6–8 pairs, prominently elevated beneath; pedicels very numerous, scarcely 5 mm long; calyx lobes orbicular, about 4 mm long, strongly imbricate, concave, strigillose without, glabrous within, ciliolate; corolla orange, 10–11 mm long, erect, not saccate at base, ventricose upwardly, puberulous externally, with a hairy ring within at insertion of filaments, contracted in throat, the throat glabrous within, the lobes small, strongly ciliate; androecium glabrous; ovary glabrous; style densely puberulous; berry orange.

TYPE: Cerro de Ponasa, Dept. Loreto, Peru, *Ule* 6667 (B).

RANGE: Peru, at 1,200 meters elevation.

14. Besleria cognata Morton, sp. nov.

Caules quadrangulares strigillosi; petioli elongati glabri; lamina foliorum late elliptica vel elliptica, coriacea integra, supra fere glabra, subtus ubique strigillosa; pedicelli pauci strigillosi; calycis lobi suborbiculares, basi connati, rotundati, leviter erosi, subcoriacei, ciliolati, parce strigillosi; corolla aurantiaca ecalcarata erecta glabra ventricosa, lobis parvis erectis; ovarium glabrum; discus annularis.

Shrub 1.2–1.5 m high, the stems quadrangular, strigillose; petioles up to 6 cm long, glabrous; leaf blades broadly elliptic or elliptic, the larger 18 cm long and 7 cm wide, acuminate at apex, broadly and obliquely cuneate at base, coriaceous, entire, almost glabrous above, strigillose beneath, the primary veins 8 or 9 pairs:

common peduncle obsolete, the pedicels few, 1 cm long, strigillose; calyx lobes suborbicular, 3.5 mm long, connate at base, rounded, lightly erose, ciliolate, sparsely strigillose externally, glabrous within; corolla orange, about 12 mm long, erect, not spurred or saccate at base, the tube about 6 mm wide, gradually ventricose upwardly, glabrous externally, bearing a hairy ring within at insertion of stamens, the throat contracted, about 4 mm wide, the limb terminal, narrow, the lobes subequal, erect; filaments glabrous; ovary and style glabrous; disk annular, entire, short, glabrous; berry small.

Type in the U. S. National Herbarium, no. 1,482,468, collected in region of Mount Chapón, Department of Boyacá, Colombia, altitude 2,250 meters, June 3, 1932, by A. E. Lawrance (no. 150).

ADDITIONAL SPECIMENS EXAMINED: Type collection (B, K, S).

15. Besleria glabra (Oersted) Hanst. Linnaea 34: 325. 1865.

Gasteranthopsis glabra Oersted, Centralamer. Gesn. 55. *pl. 10, fig. 1–8.* 1858.

Shrub; stems strigose at apex, otherwise glabrous; petioles glabrous, up to 4.5 cm long; leaf blades obliquely elliptic-oblong, up to 22 cm long and 9 cm wide, cuneate at base, glabrous beneath, entire, the primary veins 8–10 pairs; pedicels few, glabrous, up to 2.2 cm long; calyx lobes oval, 3–4 mm long, obtuse, membranous, scarious-margined, puberulous externally, glabrous within, faintly nerved; corolla red, erect at base, not calcarate, upwardly a little ventricose, 15–20 mm long, glabrous, lacking a hairy ring within; androecium glabrous; ovary and style glabrous; disk semiannular, glabrous.

TYPE: Lacoba, Chinantla, State of Puebla, Mexico, *Liebmann* (Co).

RANGE: Mexico.

ADDITIONAL SPECIMENS EXAMINED: Type collection (F, W). Oaxaca, *Galeotti* 1921 (F, W).

16. Besleria conspecta Morton, sp. nov.

Caules subquadrangulares, apice dense strigosi, mox glabri; petioli elongati graciles glabrati; lamina foliorum oblique late-elliptica, magna, cuspidato-acuminata, basi angustata, membranacea integra, subtus in venis parce puberula; pedicelli pauci glabrati; calycis lobi orbiculares rotundati imbricati aequales glabri suberosi ciliolati; corolla lutea erecta ecalcarata ventricosa, externe glabra, fauce contracta, limbo terminali parvo, lobis aequalibus glabris; ovarium glabrum; discus annularis.

Slender shrub up to 1.2 m high, the stems subquadrangular, densely strigose at apex, glabrate below; petioles slender, up to 9 cm long, glabrate; leaf blades obliquely elliptic, up to 21 cm long and 10.5 cm wide, cuspidate-acuminate at apex, narrowed at base, thin-membranous, entire, bearing a few scattered hairs above, the veins beneath sparsely appressed-pubescent, the primary veins 9–11 pairs; common peduncle obsolete, the pedicels few, up to 1.5 cm long, slender, glabrate; calyx lobes orbicular, about 5 mm long, rounded, not mucronate, imbricate, equal, erect, glabrous, the margin suberose and ciliolate; corolla yellow, about 19 mm long, erect, not spurred or saccate at base, the base about 4 mm wide, the tube upwardly ventricose, becoming 8 mm wide, glabrous externally, glandular-pilosulous within above middle, the throat contracted, about 5.5 mm wide, the limb terminal, 8 mm wide, the lobes small, suborbicular, about 2 mm long, equal, glabrous, not ciliate; filaments glabrous, inserted about 3 mm above the base of the corolla; ovary and style glabrous; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 1,637,918, collected at Palmar, Department of Quezaltenango, Guatemala, altitude 960–1,290 meters, Oct. 11, 1934, by Alexander F. Skutch (no. 1413).

17. Besleria nitens Fritsch, Notizbl. Bot. Gart. Berlin **11**: 964. 1934.

Stems slender, strigose toward apex; petioles 3.5–6 cm long; leaf blades obliquely lance-elliptic, up to 20 cm long and 8 cm wide, attenuate at base, entire, membranous, sparsely strigillose beneath, the primary veins 8–11 pairs; pedicels few, up to 12 mm long; calyx orange, about 6 mm long, the lobes orbicular, united for about one third their length, subcoriaceous, sparsely strigillose without, glabrous within, the margin subscarious, ciliolate, erose; corolla dark red, 17–20 mm long, erect, not spurred, scarcely ventricose upwardly, subcarnose, glabrous without and within; androecium glabrous, the anthers connate; ovary and style glabrous; stigma not bilobed; disk annnular, glabrous.

TYPE: Tequendame, Dept. Santander, Colombia, *Kalbreyer* 1009 (B).

RANGE: Colombia, at 1,200 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Type collection (K). This duplicate is a much better specimen than the actual type.

The flowers suggest *B. formosa*, and that species is perhaps more closely related than the present order of species would indicate. The common peduncle, though short, is developed in *B. formosa*, and bears a solitary, long pedicel. In the present species the common peduncle is obsolete, but if it were developed the flowers would be umbellate. The calyx lobes are similar, but the corolla limb is much broader in *B. formosa*. The leaves also are different, those of *B. nitens* being much larger and longer-petiolate.

18. Besleria nubigena Morton, sp. nov.

Caules crassi glabrati; petioli elongati crassi strigillosi; lamina foliorum late elliptica, membranacea, basi cuneata, vix denticulata, subtus imprimis in venis strigillosa; pedicelli dense aggregati, brevissimi, pilosuli; calycis lobi oblongo-lanceolati acuti liberi integri, parce puberuli; corolla flava parva, anguste tubulosa, ecalcarata, non ventricosa, externe pilosa, fauce vix contracta, lobis parvis erectis aequalibus; ovarium apice parce puberulum; discus annularis.

Herb with thick, quadrangular, glabrate stems; petioles 6.5–9 cm long, thick, strigillose; leaf blades broadly elliptic, up to 17 cm long and 9 cm wide, short-acuminate, cuneate at base, membranous, minutely denticulate, glabrate above, strigillose beneath, especially on the veins, the primary veins about 14 pairs; common peduncle obsolete, the pedicels numerous, densely aggregate, about 4 mm long, pilosulous; calyx lobes oblong-lanceolate, 7–8 mm long, 2 mm wide, acute, free, entire, sparsely puberulous; corolla yellow, 12 mm long, narrowly tubular, not spurred, a little saccate at base, not ventricose upwardly, the tube about 2.5 mm wide, externally pilose, glabrous within, the throat hardly contracted, the limb terminal, narrow, the lobes small, erect, equal; ovary sparsely puberulous at apex; style nearly glabrous; disk annular, thick, entire, glabrous.

Type in the Academy of Natural Sciences, Philadelphia, no. 642,555, collected along stream in forest, Río San Rafael, below Cerro Tatamá, Department of Caldas, Colombia, altitude 2,500–2,800 meters, Sept. 7–11, 1922, by F. W. Pennell (no. 10412).

ADDITIONAL SPECIMEN EXAMINED: Type collection (Y).

19. Besleria filipes Urban, Symb. Antill. **2**: 350. 1901.

Stems 0.3–1 m high, glabrous except at nodes; petioles 2–4 cm long; leaf blades chartaceous, oblanceolate, up to 14 cm long, 4.5–5.5 cm wide, attenuate at base, sharply serrate, strigillose beneath on nerves, the primary veins 10 or 11 pairs; pedicels few, elongate, 4.5–5 cm long, strongly thickened toward apex; calyx lobes ovate, 6–6.5 mm long, united near base, entire, short-mucronate, glabrous except for the copiously ciliate margin; corolla erect, 17–18.5 mm long, slightly ventricose

upwardly, glabrous, the lobes large, unequal, the larger ones about 6 mm long, minutely ciliolate; ovary glabrous; disk annular.

TYPE: Trois-Rivières, Guadeloupe, *Duss* 2376.

RANGE: Guadeloupe.

SPECIMENS EXAMINED: Type collection (Y).

In vegetative characters this species is highly variable, and three forms from Dominica are described below. A specimen of the type number in the U. S. National Herbarium does not agree with that in the New York Botanical Garden. Inasmuch as the latter was annotated by Urban, it is accepted as typical of the species. The National Herbarium specimen is doubtless conspecific but represents a variant form. Another variant, also from Guadeloupe, is *Duss* 3385 in the New York Botanical Garden.

19a. Besleria filipes forma **latior** Morton, f. nov.

A f. *typica* caulibus parce et persistente strigillosis, foliis late ellipticis, 6–8.3 cm latis differt.

Differs from the typical form in the sparsely but persistently strigillose stems, and in the broadly elliptic leaf blades, 6–8.3 cm wide.

Type in the New York Botanical Garden, collected in Dominica by W. C. Fishlock (no. 12).

19b. Besleria filipes forma **glaberrima** Morton, f. nov.

A f. *typica* foliis anguste oblongis crenulatis glaberrimis, calycis lobis fere eciliatis differt.

Differs from the typical form in the entirely glabrous, crenulate, narrowly oblong leaf blades and the non-ciliate calyx lobes.

Type in the New York Botanical Garden, collected in Dominica, Jan. 22, 1933, by G. Proctor Cooper (no. 47).

19c. Besleria filipes forma **pilicaulis** Morton, f. nov.

A f. *typica* caulibus dense et persistente sericeis, foliis crenulatis haud serratis differt.

Differs from the typical form in the densely and persistently sericeous stems and in the crenulate rather than serrate leaf blades.

Type in the New York Botanical Garden, collected on the Lisdara Estate, Dominica, altitude 560–600 meters, Mar. 7, 1933, by G. Proctor Cooper (no. 157). Duplicate in the U. S. National Herbarium.

20. Besleria sieberiana Urban, Symb. Antill. **2**: 349. 1901.

Stems strigose at apex; petioles 4–7 mm long; leaf blades ovate or narrowly ovate, 8–14 cm long, 4–7.5 cm wide, rounded or obtuse at base, membranous or subchartaceous, serrate, pilosulous beneath on veins, the primary veins 10–12 pairs; pedicels 10–15 mm long; calyx lobes connate nearly to middle, 5 mm long, ovate, obtuse, mucronulate; corolla 17–18 mm long, cylindric, a little curved, glabrous; ovary glabrous; stigma bilobed; disk annular.

TYPE: Trinidad, *Sieber* 193 p. p.

The description is compiled from Urban. It is doubtful if this species is really different from *B. strigillosa* Urban. Both were described from parts of the same collection. I saw a specimen of *Sieber* 193 from the Kew Herbarium, I believe, but unfortunately lost my notes on it.

21. Besleria strigillosa Urban, Symb. Antill. **2**: 349. 1901.

Stems strigose at apex; petioles 15–20 mm long; leaf blades ovate, those of a pair unequal, the larger one 8–11 cm long, 4–6 cm wide, obtuse at base, membranous, serrate, short-pilose on both sides, the veins beneath strigose, the primary veins 8–12 pairs; pedicels few, about 15 mm long; calyx lobes free, orbicular,

rounded, not mucronulate, sparsely pilosulous externally, ciliolate; corolla glabrous; ovary glabrous.

TYPE: Trinidad, *Sieber* 193 p. p.

This species is placed in the key from description only. Compare note on *B. sieberiana.*

22. Besleria lanceolata Urban, Symb. Antill. **2**: 351. 1901.

Besleria coriacea Urban, loc. cit.

Suffrutescent, 1.3–1.6 m high; stems hirsutulous at apex; petioles 1–3 cm long; leaf blades lanceolate or oblong-lanceolate, 10–18 cm long, 3–3.5 cm wide, attenuate at base, crenulate, sparingly hirsutulous beneath, the primary veins 7–11 pairs; pedicels 1–4 in each axil, 1–4 cm long; calyx lobes nearly free, oval or narrowly ovate, about 5 mm long, obtuse, subcoriaceous, strigillose, ciliolate, the midrib thickened and extended into a short mucro; corolla not gibbous at base, 14–18 mm long, glabrous externally; ovary glabrous; disk annular; fruit about 5 mm in diameter.

TYPE: Martinique, *Bélanger* 193 (photograph, W).

RANGE: Martinique and Guadeloupe.

SPECIMENS EXAMINED: Photograph of type (F). Mount Pelée, Martinique, *Hahn* 1420 (S). Without specific locality, *Hahn* 314 (K, W), 612 (K); *Isert* (Co).

From description I am unable to separate *B. coriacea*, described from Guadeloupe.

23. Besleria standleyi Morton, Field Mus. Publ. Bot. **18**: 1155. 1938.

Shrub 1 m high; stems fleshy, 4 mm thick, sericeous; petiole 1.5–2.5 cm long, sericeous; leaf blades broadly elliptic, up to 18 cm long and 10 cm wide, obtuse at apex, obtuse or broadly cuneate at base, denticulate, green and glabrous above, pale and minutely sericeous beneath, the primary veins about 10 pairs; common peduncle obsolete, the pedicels very numerous, densely aggregate, about 10 mm long, thickened at apex, brown-sericeous; calyx lobes orbicular, 4.5 mm long, rounded, veiny, suberose, ciliolate, sericeous externally; corolla orange, 13 mm long, erect or oblique, not spurred, saccate at base, not much ventricose, the tube 5–6 mm wide, nearly glabrous, lacking a hairy ring within, the limb terminal, narrow, the lobes small, rounded, equal; androecium glabrous; ovary pilosulous; style thick; stigma bilobed; disk annular, entire, glabrous.

TYPE: La Palma, Prov. San José, Costa Rica, altitude 1,600 meters, *Standley* no. 33005 (W).

24. Besleria notabilis Morton, Field Mus. Publ. Bot. **18**: 1153. 1938.

Shrub 1 m high, the stems about 1 cm thick, angulate, appressed-pubescent; petioles 3 cm long, thick, pubescent; leaf blades elliptic, the larger 22 cm long and 10 cm wide, short-acuminate at apex, cuneate at base, entire, subcoriaceous, puberulous beneath, the veins and margin subtomentose, the primary veins 6–8 pairs; common peduncle obsolete, the pedicels numerous, aggregate, about 10 mm long, pubescent; calyx lobes oblong, 3 mm long, 1.5 mm wide, obtuse, free, ciliolate, sparsely puberulous externally, glabrous within; corolla yellowish-orange, 9–10 mm long, erect, not spurred, the tube 2 mm wide, glabrous on both sides, the limb terminal, narrow, the lobes small, obtuse, equal; androecium glabrous; ovary minutely puberulous at apex; style glabrous; stigma bilobed; disk annular, glabrous; berry white, subtended by the purple calyx.

TYPE: La Palma, Prov. San José, Costa Rica, altitude 1,500 meters, *Werckle* (Herb. Nat. Cost. 11603) (W).

RANGE: Costa Rica and Panama, at 900 to 1,700 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: La Hondura, Prov. San José, *M. Valerio* 749 (F). La Palma, Prov. San José, *M. Valerio* 1412 (F); *Tonduz* 7456 (W). Cerro de la Palma,

Prov. Alajuela, *Brenes* 3750 (F). Pejivalle, Prov. Cartago, *Standley & Valerio* 49121 (W).

PANAMA: ? Cricamola Valley, Prov. Bocas del Toro, *Cooper* 197 (F, Y).

This has commonly been misidentified either as *B. costaricensis* or *B. robusta*. The former is, as evidenced by the type, a synonym of *B. solanoides*. The latter differs strongly in pubescence and in characters of the calyx and corolla.

25. Besleria illustris Morton, sp. nov.

Caules teretes crassi superne villosi; petioli lanati; lamina foliorum ovato-elliptica, acuta, basi cuneata, membranacea, integra vel inconspicue denticulata, utrinque strigillosa; pedicelli numerosi breves, vix pubescentes; calycis lobi oblongi liberi acuti, saepe plus minusve dentati, externe pilosuli; corolla lutea deflexa ecalcarata, basi paullo saccata, sursum ventricosa, externe pilosa, fauce contracta, lobis parvis erectis aequalibus; ovarium dense pilosum; discus in glandulam posticam glabram crassam reductus.

Subligneous herb 1.5 m high, the stems terete, thick, villous upwardly; petioles short or up to 3.5 cm long, lanate; leaf blades ovate-elliptic, the larger 12.5 cm long and 6.5 cm wide, acute, cuneate at base, membranous, entire or inconspicuously denticulate, strigillose on both sides, the primary veins about 10 pairs; common peduncle obsolete, the pedicels numerous, very short (about 4 mm long), slightly pubescent; calyx lobes oblong, 6.5 mm long, free, acute, often somewhat toothed, pilosulous externally, glabrous within; corolla yellow, 15 mm long, deflexed, not spurred, a little saccate at base posteriorly, densely pilose, the tube gradually ventricose upwardly, becoming 7 mm wide, the throat contracted and 5 mm wide, the limb terminal, narrow, the lobes small, erect, equal; ovary and style pilose; disk reduced to a fleshy, glabrous, posterior gland.

Type in the herbarium of the Royal Botanic Gardens, Kew, collected in the region of Mount Chapón, Department of Boyacá, Colombia, altitude 1,050 meters, June 18, 1932, by A. E. Lawrance (no. 246).

RANGE: Dept. of Boyacá, Colombia.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, W). Same locality, *Lawrance* 82 (F, W).

26. Besleria tambensis Morton, sp. nov.

Caules crassi, densissime tomentosi; petiolus brevis crassus, dense tomentosus; lamina foliorum obovata magna, breviter acuminata, subcoriacea integra, dense ciliata, supra mox glabra, subtus in venis tomentosa; pedicelli numerosi brevissimi, dense tomentosi; calycis lobi liberi elliptici subaequales, vix imbricati, paullo apiculati, acutiusculi, externe dense tomentosi; corolla paullo obliqua, ecalcarata, non ventricosa, externe pilosa, intus glabra, lobis parvis subaequalibus; ovarium pilosum; discus annularis glaber.

Stems very thick, about 7 mm in diameter, densely matted-tomentose; leaves a little unequal, short-petiolate, the petiole about 1.4 cm long, thick, densely tomentose, the blade obovate, up to 19 cm long and 8.5 cm wide, short-acuminate, obtuse at base, subcoriaceous, entire, densely ciliate, soon glabrous above, tomentose on the veins beneath, the primary veins 9 or 10 pairs; common peduncle obsolete; pedicels densely aggregate in the leaf axils, scarcely 4 mm long, densely tomentose; calyx lobes free, elliptic, about 4 mm long, subequal, hardly imbricate, acutish, a little apiculate, densely tomentose externally, glabrous within; corolla tubular, 14 mm long, a little oblique, not spurred, the tube a little saccate above base posteriorly, cylindric upwardly, scarcely ventricose, about 3.5 mm wide, pilose externally, glabrous within, the throat not contracted, the limb terminal, about 4 mm wide, the lobes about 1 mm long, subequal, not ciliate, pilosulous externally, eglandular within; filaments glabrous; ovary pilose; style glabrous; stigma bilobed; disk short, annular, glabrous.

Type in the herbarium of the Naturhistoriska Rijksmuseet, Stockholm, collected at La Costa, District of El Tambo, Department of El Cauca, Colombia, altitude 1,200 meters, July 26, 1936, by Kjell von Sneidern (no. 850).

Most nearly related is perhaps *B. notabilis* of Costa Rica, which agrees in having numerous, small, short-pedicellate axillary flowers and large, coriaceous, hairy-marginate leaves. The dense velvety-tomentose pubescence of the stems, petioles, and calyx lobes of the present species is, however, distinctive and is not matched elsewhere in the genus. *Besleria maxima* is also closely allied, but in that species the pubescence of the costa and veins beneath is hirsute.

27. Besleria maxima Morton, sp. nov.

Caules crassi, longe tomentoso-villosi; petiolus crassus tomentoso-villosus; lamina foliorum late oblonga, magna acuta, basi late cuneata, membranacea, fere integra, supra glabrescens, subtus in venis hirsuta; pedicelli numerosi breves; calycis lobi liberi aequales oblongo-lanceolati acuti, breviter mucronati, externe hirti; corolla paullo obliqua, ecalcarata, non ventricosa, utrinque fere glabra, lobis parvis aequalibus; ovarium pilosulum; discus annularis glaber.

Stems thick, 8–10 mm in diameter, conspicuously long-tomentose-villose; petiole 7–15 mm long, very thick, tomentose-villose; leaf blades broadly oblong, up to 28 cm long and 16.2 cm wide, acute, broadly cuneate at base, membranous, nearly entire, glabrescent above, hirsute beneath especially on the veins, the primary veins 10 to 12 pairs; common peduncle obsolete; pedicels densely aggregate in the leaf axils, short, up to 7 mm long; calyx lobes free, oblong-lanceolate, about 5 mm long, entire, equal, acute, thickened and a little mucronate at apex, hirtous externally, glabrous within; corolla a little oblique, 12 mm long, not spurred, the tube about 4.5 mm wide, not ventricose nor ampliate, nearly glabrous externally, sparsely pilosulous toward apex, glabrous within, the throat scarcely contracted, glabrous within, the limb terminal, about 4.5 mm wide, the lobes about 1 mm long, erect, rounded, equal, glabrous; filaments inserted about 4 mm above the base of the corolla, glabrous, not contorted; anthers connate; staminodium well developed, about 2 mm long, bearing a sterile anther; ovary pilosulous; style glabrous; stigma bilobed; disk annular, 0.5 mm high, glabrous.

Type in the herbarium of the Naturhistoriska Rijksmuseet, Stockholm, collected in virgin forest at La Costa, District of El Tambo, Department of El Cauca, Colombia, altitude 1,000 meters, July 29, 1936, by Kjell von Sneidern (no. 891). Two additional specimens were collected at the same locality by Sneidern (nos. 849 and 890).

28. Besleria barbata (Poepp.) Hanst. Linnaea 34:327. 1865.

Hypocyrta barbata Poepp. Nov. Gen. & Sp. 3: 3. 1845.

Shrub with thick hirsute stems: petioles up to 4 cm long; leaf blades broadly elliptic, 22–26 cm long, 10–13 cm wide, short-acuminate, cuneate at base, subcoriaceous, remotely but sharply denticulate, glabrous above, sparingly hirsute beneath on midrib and veins, the primary veins 9 pairs; pedicels numerous, about 1 cm long; calyx lobes oblong, 6.5–7 mm long, rounded at apex, much imbricate, sparingly pilosulous externally, glabrous within, conspicuously long-ciliate; corolla orange, 12 mm long or probably a little longer, erect, not saccate at base, glabrous externally, the limb terminal, the lobes small, equal; ovary glabrous; disk annular, glabrous.

Type: Pampayaco, Peru, *Poeppig* (photograph, W).

Range: Peru.

Specimen examined: Amazon River, *Poeppig* 1508, compared with type in Vienna by Mansfeld.

29. Besleria imberbis Morton, sp. nov.

Caules apice dense pilosi; petiolus pilosus; lamina foliorum elliptica acuminata, basi cuneata, chartacea, remote denticulata, supra glabra, subtus pilosa; pedicelli numerosi pilosi; calycis lobi oblongi obtusi membranacei integri, vix mucronati, externe pilosuli; corolla aurantiaca erecta ecalcarata, sursum ventricosa, utrinque glabra, fauce contracta, limbo parvo subregulari; ovarium glabrum; discus annularis glaber.

Shrub, the stems densely pilose toward apex; petioles up to 2 cm long, pilose; leaf blades elliptic, up to 9 cm long and 3.5 cm wide, acuminate, cuneate at base, chartaceous, remotely denticulate, glabrous above, pilose beneath, the primary veins 7 to 9 pairs; common peduncle obsolete; pedicels numerous, about 18 mm long, pilose; calyx lobes oblong, 5 mm long, obtuse, hardly mucronate, entire, membranous, pilosulous externally, glabrous within; corolla orange, about 12 mm long, erect, not spurred, not saccate at base, the tube about 4 mm wide, upwardly ventricose, glabrous on both sides, the throat contracted, the limb terminal, small, subregular; filaments glabrous; ovary glabrous; style sparsely strigose; stigma bilobed; disk annular, glabrous.

Type in the Berlin Herbarium, collected at Tambillo, Department of Cajamarca, Peru, Apr. 17, 1878, by A. Raimondi (no. 5334).

30. Besleria hirsuta (Oersted) Hanst. Linnaea 34: 326. 1865.

Gasteranthopsis hirsuta Oersted, Centralamer. Gesn. 55. *pl. 10, fig. 9–13.* 1858.

Shrub; stems hirsute; petioles up to 6.5 cm long, hirsute; leaf blades oblong, up to 23 cm long and 9.5 cm wide, attenuate at base, obsoletely serrulate,hirsute on the veins beneath, the primary veins 11–13 pairs; pedicels hirsute, about 1 cm long; calyx about 5 mm long, the lobes free, oblong or suborbicular, rounded, membranous, short-pilosulous; corolla about 18 mm long, glabrous without and within; ovary glabrous; disk annular.

TYPE: Chinantla, State of Pueblo, Mexico, *Liebmann* (Co).

RANGE: Mexico and Costa Rica.

ADDITIONAL SPECIMEN EXAMINED:

COSTA RICA: Siquirres, Prov. Limón, *J. D. Smith* 6714 (W).

31. Besleria fecunda Morton, sp. nov.

Caules quadrangulares hirsuti; petiolus longus, parce hirsutus; lamina foliorum late elliptica, magna, cuspidato-acuminata, basi late cuneata, membranacea denticulata, supra parce pilosula, subtus in venis parce hirsuta; inflorescentia subcorymbosa, pedunculo communi brevi hirsuto; pedicelli numerosi hirsuti; calycis lobi suborbiculares subaequales imbricati liberi subcoriacei, margine subscariosi, paullo undulati, externe pilosi; corolla lutea obliqua ecalcarata, basi gibbosa, utrinque glabra, vix ventricosa, limbo parvo; ovarium glabrum; discus annularis glaber.

Slender shrub, the stems subquadrangular, hirsute; petioles elongate, up to 8.5 cm, sparingly hirsute; leaf blades broadly elliptic, up to 28 cm long and 14.5 cm wide, cuspidate-acuminate, broadly cuneate at base, thin-membranous, remotely denticulate, sparsely pilosulous above, hirsute beneath especially on the veins, the primary veins 8 to 10 pairs; inflorescence subcorymbose, about 4.5 cm long, the common peduncle short, about 4.5 mm long, hirsute; pedicels numerous, up to 1.5 cm long, hirsute; calyx lobes suborbicular, about 6 mm long, free, subequal, strongly imbricate, subcoriaceous, the margin subscarious, a little undulate, externally pilosulous, glabrous within; corolla yellow, 20–23 mm long, oblique, not spurred at base but saccate above base, the tube about 7 mm wide, scarcely ventricose, glabrous on both sides, the throat slightly contracted, the limb terminal, about 1 cm wide, the lobes suborbicular, 4 mm long, subequal, not glandular within; filaments glabrous; ovary and style glabrous; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 1,661,595, collected in the vicinity of Barranca Bermeja, Magdalena Valley, between Sogamoso and Colorado Rivers, Department of Santander, Colombia, altitude 100–500 meters, Nov. 19, 1934, by Oscar Haught (no. 1428).

RANGE: Colombia, at low elevations.

ADDITIONAL SPECIMEN EXAMINED: Viscaina Creek, Dept. Magdalena, *Haught* 2049 (W).

In some respects the present species suggests the North American *B. hirsuta* (Oerst.) Hanst., in which the common peduncle is obsolete, the few flowers being aggregate in the leaf axils. This is in decided contrast to the present species, in which the flowers are borne in short-pedunculate subcorymbose inflorescences. The leaves of the two species differ also, those of *B. hirsuta* being relatively narrower, with closer and more numerous veins. In that the blade is gradually acuminate at apex, in contrast to the cuspidate-acuminate blade of the present species.

32. Besleria saxicola Morton, Phytologia 1: 151. 1935.

Shrub with terete hirsute stems; petioles hirsute, 7–11 cm long; leaf blades membranous, 20–30 cm long, 8–12 cm wide, narrowed at base, remotely sharp-serrulate, hirsute, especially on the veins beneath, the primary veins 7–9 pairs; common peduncle obsolete; pedicels numerous, scarcely 1 cm long; calyx lobes free, yellow, ovate, imbricate, 6–8 mm long, subulate-acuminate, hirsute, long-ciliate; corolla yellow, 20 mm long, glabrous, not saccate, a little ventricose upwardly; style puberulous; disk semiannular.

TYPE: Tumatumari, Potaro River, British Guiana, *Hitchcock* 17375 (W).

RANGE: British Guiana.

ADDITIONAL SPECIMENS EXAMINED: Type collection (Y). Type locality, *Gleason* 420 (G, W, Y). Moraballi Creek, *Sandwith* 58 (K, Y). Potaro River, *Abraham* 345 (K).

33. Besleria villosa Fritsch, Notizbl. Bot. Gart. Berlin 11: 964. 1934.

Stems very densely long-villous; petioles villous, 7–15 cm long; leaf blades elliptic-oblanceolate, up to 13 cm long and 4 cm wide, entire, cuneate at base, densely hirsute beneath on veins and margin, pilose on mesophyll, the primary veins 8 or 9 pairs; pedicels few, hirsute, about 10 mm long; calyx 4 mm long, the lobes rounded, hirsute, glabrous within, nearly free; corolla pubescent without, glabrous within; ovary puberulous; disk annular.

TYPE: Between Tuquerres and Barbacoas, Dept. Nariño, Colombia, *Triana* (B).

RANGE: Western Cordillera of Colombia, at 900 meters elevation.

34. Besleria vestita Fritsch, Notizbl. Bot. Gart. Berlin 11: 97. 1934.

Herb with villous stems 0.5 m high; petioles villous, 2–4 cm long; leaf blades elliptic, up to 9 cm long and 5 cm wide, membranous, broadly cuneate at base, entire, hirsute above, the hairs with inflated bases, in falling leaving the surface pustulate-scabrous, finely hirsute beneath, the primary veins 10–15 pairs; pedicels villous, short, not over 5 mm long; calyx lobes free, lanceolate, acuminate, 4–5 mm long, entire, hirsute externally, glabrous within; corolla chrome-yellow or orange, 13–15 mm long, erect at base, not saccate, upwardly a little deflexed, strongly ventricose, externally pilose, with a dense hairy ring within at the insertion of the filaments, the throat contracted, the limb terminal, regular; androecium glabrous; ovary and style puberulous; disk annular, glabrous; berry orange.

TYPE: Las Juntas del Dagua, region of Buenaventura, Dept. El Valle, Colombia, *Lehmann* 5854 (B).

RANGE: Colombia, from sea-level to 2,100 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K, W). La Cumbre, Dept. El Valle, *Killip* 11626 (W); *Pennell* 5875 (P, W, Y), 5891 (P, Y). Medellín, Dept. Antioquia, *Toro* 1232 (Y).

35. Besleria laeta Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum elliptica crassa acuta, basi cuneata, integra, supra elongato-tuberculata, tuberculis apice piliferis, subtus dense hirsuta; pedicelli numerosi hirsuti; calycis lobi ovales obtusi integri, fere liberi, externe hirsutuli; corolla erecta ecalcarata, fere tubulosa, sursum paullulum ventricosa, externe puberula, intus glabra, lobis parvis subaequalibus; ovarium pilosum; discus annularis.

Stems slightly quadrangular, hirsute; petioles up to 3.5 cm long, hirsute; leaf blades elliptic, the largest 11 cm long and 5 cm wide, thick, acute, cuneate at base, entire, elongate-tuberculate above, the tubercles piliferous, densely hirsute beneath, the primary veins about 11 pairs; common peduncle obsolete; pedicels densely aggregate in the leaf axils, about 6 mm long, hirsute; calyx lobes oval, 5 mm long, 2.5 mm wide, obtuse, entire, nearly free, externally hirsutulous, glabrous within; corolla 12–15 mm long, erect, not spurred, nearly tubular, slightly ventricose upwardly and becoming 5 mm wide, puberulous externally, glabrous within, the throat contracted, the limb small, terminal, the lobes erect, rounded, subequal; filaments contorted, glabrous, the anthers connate; ovary pilose; style puberulous; stigma bilobed; disk annular, entire.

Type in the Kew Herbarium, collected at Alto de Cruz Grande, Colombia, Dec. 14, 1896, by E. André (no. K. 1482).

36. Besleria trichostegia Donn. Smith, Bot. Gaz. **61**: 380. 1916.

Stems slender, sparingly hirsute; petioles hirsute, up to 2 cm long; leaf blades oblanceolate, up to 17 cm long and 6.5 cm wide, narrowed at base, entire, ciliate, hirsute beneath, especially on veins, the primary veins 7–10 pairs; pedicels few, 8–13 mm long, hirsute, very slender; calyx 5–6 mm long, the lobes free, linear-lanceolate, about 1 mm wide at base, entire, long-pilose; corolla red, 11–13 mm long, pilose without, glabrous at insertion of filaments, sparsely pilose within throat; ovary pilose; disk semiannular.

TYPE: Tsaki, Prov. Limón, Costa Rica, *Tonduz* 9558 (W).

RANGE: Costa Rica, at low elevations on the Atlantic coast.

ADDITIONAL SPECIMEN EXAMINED: Type locality, *Tonduz* 9408 (W).

37. Besleria montana Britt. Mem. Torrey Club **4**: 240. 1895.

Stems hirsute; petioles hirsute, up to 6 cm long; leaf blades elliptic, up to 20 cm long and 9.5 cm wide, denticulate, cuneate at base, hirsute beneath on veins, the primary veins 9 or 10 pairs; common peduncle none; pedicels numerous, hirsute, 5 mm long or less; calyx about 9.5 mm long, the lobes united for about 3 mm, ovate, acute, entire, externally hirsute, glabrous within, the tips recurved; corolla about 20 mm long, hardly ventricose, externally densely lanate-pilose, glabrous within, not glandular in throat; stamens strongly didynamous, the anthers free; ovary sparingly pilose at apex; disk annular.

TYPE: Yungas, Bolivia, *Bang* 412 (Y).

RANGE: Bolivia.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, M, P, W). La Paz, *Rusby* 2150 (W, Y). Yungas, *Rusby* 2425 (W, Y). Hacienda Simaco, above road to Tipuani, *Buchtien* 5564 (W).

38. Besleria boliviana Morton, sp. nov.

Caules petiolique flavo-hirsuti; lamina foliorum elliptica acuminata membranacea integra, supra parce hirsuta, subtus praecipue in venis hirsuta; pedicelli pauci hirsuti breves; calycis lobi lanceolati liberi acuminati integri, parce hirsuti,

longe ciliati; corolla rubra erecta ecalcarata, externe parce pilosa, intus glabra, sursum paullo ventricosa, limbo parvo; ovarium apice parce pilosum; discus annularis glaber.

Stems subquadrangular, densely yellowish-hirsute; petioles up to 5.5 cm long, hirsute; leaf blades elliptic, up to 19 cm long and 7 cm wide, acuminate, narrowed at base, membranous, entire, sparsely hirsute above, hirsute beneath especially on the veins, the primary veins 9 or 10 pairs; common peduncle obsolete; pedicels few, scarcely 5 mm long, hirsute; calyx lobes lanceolate, 6 mm long, about 2 mm wide, acuminate, free, entire, sparsely hirsute, long-ciliate, not recurved at apex; corolla red, 13 mm long, erect, not spurred, externally sparingly pilose, glabrous within, upwardly a little ventricose, becoming 4 mm wide, the throat a little contracted, the limb terminal, narrow, the lobes rounded, ciliolate; filaments glabrous; anthers connate; ovary sparsely pilose at apex; stigma stomatomorphic; disk low, annular, glabrous.

Type in the U. S. National Herbarium, no. 1,399,336, collected at San Carlos, Mapiri Regior, Bolivia, altitude 850 meters, Jan. 30, 1927, by Otto Buchtien (no. 1334c).

From *Besleria montana* the present species differs in its smaller calyx, with free, lanceolate, narrower lobes, not recurved at tips. The corolla also is smaller and much less densely pilose.

39. Besleria leucostoma (Hook.) Hanst. Linnaea **34**:326. 1865.

Hypocyrta leucostoma Hook. Bot. Mag. Curtis **73**: *pl. 4310.* 1847.

Stems densely hirsute; petioles densely hirsute, up to 15 mm long; leaf blades narrowly elliptic, up to 15 cm long and 4.5 cm wide, broadly cuneate at base, membranous, minutely crenulate (the teeth very numerous), sparingly hirsute above, densely so beneath, the primary veins about 10 pairs; pedicels hirsute, up to 12 mm long; calyx lobes lanceolate, 4.5 mm long, free, acute, hirsute externally, glabrous within; corolla about 17 mm long, erect, not saccate at base, a little ventricose upwardly, sparingly pilose externally, glabrous within, the limb narrow, terminal, the lobes small; androecium glabrous; ovary pilose; style glabrous except at base.

Type: A cultivated specimen grown from seed collected in Colombia by Purdie (K).

40. Besleria cinnabarina Fritsch, Notizbl. Bot. Gart. Berlin **11**:976. 1934.

Cremosperma cinnabarinum Morton, Journ. Washington Acad. Sci. **25**:290. 1935.

Shrub up to 1 m high; stems very densely hirsutulous; petioles densely hirsutulous, up to 2.5 cm long; leaf blades elliptic, the larger 7.5 cm long and 3.5 cm wide, broadly cuneate at base, entire, densely hirsutulous on both sides, the primary veins about 8 pairs; pedicels numerous, crowded, not over 2 mm long; calyx lobes lanceolate, 3.5–4 mm long, free, entire, densely hirsute externally, glabrous within, the posterior deflexed; corolla deep red, 9–10 mm long, saccate posteriorly at base, cylindric upwardly, not ventricose, densely tomentose externally, glabrous within, the lobes relatively large, patent, obviously unequal; ovary and style pilose; disk annular.

Type: Montaña de Caramanta, Dept. El Valle, Colombia, *Lehmann* 7441.

Range: Colombia, at 2,300 to 2,600 meters elevation.

Specimen examined: Type collection (K).

In his original description, Fritsch referred the present species to section *Cremosperma*. Several years ago, in my paper restoring *Cremosperma* to generic rank, I erroneously followed Fritsch and transferred this species to that genus. I have now had the opportunity of examining a specimen of the type collection and find that by no means may this species be so referred. It is a true *Besleria*, but without any close affinity to other species.

41. Besleria sprucei Britt. Bull. Torrey Club **27**: 31. 1900.

Besleria uleana Fritsch, Bot. Jahrb. Engler **37**: 483. 1906.

Shrub; stems hirsute; petioles 1.5–4 cm long, hirsute; leaf blades elliptic or oblanceolate, up to 25 cm long and 10 cm wide, membranous, serrate, cuneate at base, hirsute beneath on veins and mesophyll, the primary veins 9–11 pairs; peduncles short, up to 2.6 cm long, hirsute; pedicels 1.5 cm long or less, hirsute; calyx about 5 mm long, the lobes nearly free, linear-lanceolate, acuminate, entire, hirsutulous without, glabrous within; corolla red, 18–20 mm long, densely pilosulous without, the tube glabrous within, cylindric below middle and about 4 mm wide, abruptly and conspicuously ventricose upwardly, becoming 9 mm wide, contracted at throat, the throat glandular within, the limb small, regular, terminal; ovary and style pilosulous; disk annular.

TYPE: Mapiri, Bolivia, *Rusby* 2149 (Y).

RANGE: Eastern Bolivia at low elevations and Amazonian Brazil.

ADDITIONAL SPECIMENS EXAMINED:

BOLIVIA: Type collection (K, P, W). San Carlos, *Buchtien* 1334 (W), 1334a (W), 1334b (W), 5789 (W). Charopampa, *Buchtien* 1497 (W). Without specific locality, *Bang* 2537 (W, Y), 2538 (W, Y).

BRAZIL: Fontaleza, Rio Juruá, State of Amazonas, *Ule* 5927, type of *B. uleana* (B, photograph F).

42. Besleria reticulata Fritsch, Notizbl. Bot. Gart. Berlin **11**: 969. 1934.

Stems densely lanate-tomentose; petioles tomentose, 1.5–2 cm long; leaf blades elliptic or narrowly elliptic, up to 14 cm long and 6 cm broad, rounded at base, remotely denticulate, subpersistently sericeous above, tomentulose beneath, especially on the veins, the primary veins 9–11 pairs; peduncles 6.5–10 cm long; pedicels 1–3 cm long; calyx 4–5 mm long, the lobes nearly free, oblong, obtuse, externally strigillose, glabrous within; corolla orange, 10–13 mm long, very slightly ventricose, bearing a few long scattered hairs externally, glabrous within; ovary glabrous; style glabrous or nearly so; stigma bilobed; disk glabrous, annular.

TYPE: Diamanta, Dept. Santander, Colombia, *Kalbreyer* 1078 (B).

RANGE: Colombia, at 2,400 to 2,800 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: El Peñon, Dept. Cundinamarca, *Pennell* 2665 (G, W, Y). El Tambo, Dept. El Cauca, *Sneidern* 470 (S). Without locality, *Mutis* 919 (Madrid).

42a. Besleria reticulata var. **pubistyla** Fritsch, Notizbl. Bot. Gart. Berlin **11**: 970. 1934.

Differs from the typical form in the very short petioles, not over 7 mm long.

TYPE: Popayán, Dept. El Cauca, *Lehmann* 5128 (B).

RANGE: Western Cordillera of Colombia, at 1,500 to 2,700 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K). San José, Dept. El Cauca, *Pennell & Killip* 7394 (P, Y).

42b. Besleria reticulata var. **venosa** Morton, var. nov.

A var. *typica* foliis minoribus, venis vix reticulatis, pedunculo communi brevi vel saepissime obsoleto, calycis lobis late oblongis, 5–6 mm longis, evidenter venosis, glabratis differt.

Differs from the typical variety in the smaller, scarcely reticulate leaf blades, the short or obsolete common peduncle, and in the broadly oblong, evidently venose, glabrate calyx lobes, 5–6 mm long.

Type in the U. S. National Herbarium, no. 1,355,031, collected on road from Pamplona to Toledo, Department of Norte de Santander, Colombia, altitude 2,800–3,000 meters, Feb. 27–28, 1927, by E. P. Killip and A. C. Smith (no. 19854).

RANGE: Eastern Cordillera of Colombia, at 2,100 to 3,000 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, Y). Peñon, Dept. Cundinamarca, *Mrs. Tracey* 350 (K); *Pennell* 2417 (G, Y), 2666 (G, W, Y). Pica-Pica Valley, above Tapatá, Dept. Norte de Santander, *Killip & Smith* 20024 (W, Y).

43. Besleria lucida Poepp. Nov. Gen. & Sp. 3: 2. 1845.

Small shrub, the stems densely strigose when young; petioles up to 2 cm long, strigose; leaf blades elliptic, up to 12.5 cm long and 5 cm wide, cuneate at base, membranous, entire, strigillose beneath, especially on the veins, the primary veins 7 or 8 pairs; common peduncle 2.5–5 cm long, strigose, the pedicels subumbellate, 2 or 3, up to 2.5 cm long, strigose; calyx lobes suborbicular, 4–5 mm long, rounded, a little mucronate, nearly free, subcoriaceous, venose, sparingly strigillose externally, glabrous within, strongly ciliate, a little erose; corolla orange-red, about 15 mm long, erect, not spurred, the tube 5–7 mm wide, glabrous externally, lacking a hairy ring within, upwardly only slightly ventricose, the throat little contracted, the limb terminal, small, regular; androecium glabrous; ovary and style glabrous; disk annular, glabrous.

TYPE: Cochero, Peru, *Poeppig* (photograph, W).

RANGE: Peru, at 2,300 to 2,700 meters elevation.

SPECIMENS EXAMINED: Between Huánuco and Pampayacu, *Kanehira* 42 (G). Mirador to Chinchao, Dept. Huánuco, *Mexia* 04158 (G).

44. Besleria affinis Morton, Proc. Biol. Soc. Washington 48: 75. 1935.

Stems strigillose when young; petioles up to 9.5 cm long; leaf blades ovate or oblong, up to 28 cm long and 13 cm wide, denticulate, rounded at base, glabrate, strigillose beneath on the veins, the primary veins 11–15 pairs; peduncles pendulous, elongate, up to 21 cm long; pedicels subcorymbose, slender, up to 2 cm long; calyx about 4.5 mm long, the lobes ovate, connate about to middle, glabrous, ciliolate, mucronate; corolla red or yellow, 13–16 mm long, scarcely ventricose, glabrous, slightly pubescent in throat; ovary glabrous; disk annular.

TYPE: Ocumaré Valley, State of Aragua, Venezuela, *Pittier* 12562 (W).

RANGE: Venezuela and Colombia.

ADDITIONAL SPECIMENS EXAMINED:

VENEZUELA: Colonia Tovar, *Fendler* 2606 (K), 2365 (G). Without special locality, *Linden* 1403 (K). El Castaño, *Pittier* 13899 (F, W).

COLOMBIA: Dibulla, Dept. Magdalena, *Seifriz* 269 (W).

45. Besleria variabilis Morton, sp. nov.

Caules petiolique glabri; lamina foliorum late elliptica, magna, basi obtusa, membranacea, remote denticulata, supra glabra, subtus minute strigillosa; pedunculus communis elongatus; pedicelli subcorymbosi glabri; calycis lobi ovati glabri integri mucronati ciliolati; corolla aurantiaca vel ferruginea, erecta ecalcarata, vix ventricosa, utrinque glabra, limbo patente; ovarium glabrum; discus annularis glaber.

Shrub 1.5–2 meters high; stems subquadrangular, glabrous; petioles 4–11 cm long, glabrous; leaf blades broadly elliptic, 13–23 cm long, 5.5–13 cm wide, obtuse at base, membranous, remotely and minutely denticulate, glabrous above, minutely strigillose beneath, the primary veins 8 to 10 pairs; common peduncle 5.5–10 cm long, the pedicels subcorymbose, 2–3.5 cm long, glabrous, ascending; calyx lobes ovate, 3–4 mm long, entire, mucronate, glabrous, ciliolate, the midnerve thickened; corolla orange or rust color, 20–26 mm long, erect, not spurred, the tube scarcely ventricose, 4–5.5 mm wide, glabrous on both sides, the throat contracted, the limb terminal, spreading, rather broad (9–12 mm), the lobes subequal, sparsely puberulous externally; filaments glabrous; ovary and style glabrous; stigma bilobed; disk annular, entire, glabrous.

Type in the U. S. National Herbarium, no. 1,457,292, collected at Balsapuerto, Department of Loreto, Peru, altitude 220 meters, February 1933, by G. Klug (no. 2912).

RANGE: Eastern Peru, at low elevations.

ADDITIONAL SPECIMENS EXAMINED: Type collection (B, F, G, S). Pongo de Cainarachi, Dept. San Martín, *Klug* 2668 (F, G, S, W).

This species appears to be common in northeastern Peru. Variant forms are numerous, among them the following collections, all in the National Herbarium: Estrella, Dept. Ayacucho, *Killip & Smith* 22658 (tree, with light yellow corolla, green-tinged without); La Merced, Dept. Junín, *Killip & Smith* 23710 (herb with succulent stems, and petioles almost equaling the leaf blades), 23554 and 24016 (common peduncles short, the pedicels divergent). Worthy of nomenclatorial recognition are:

45a. Besleria variabilis forma **barbatula** Morton, f. nov.

A f. *typica* caule arborescente 2.4–4.5 m alto, corollae lobis exterioribus barbatis differt.

Differs in its arborescent stem and bearded outer corolla lobes.

Type in the U. S. National Herbarium, no. 1,460,123, collected between San Nicolás and Azupizú, Department of Junín, Peru, altitude 650–900 meters, July 6, 1929, by E. P. Killip and A. C. Smith (no. 26127).

RANGE: Eastern Peru, at 400 to 900 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Puerto Yessup, Dept. Junín, *Killip & Smith* 26332 (F, W). Estrella, Dept. Ayacucho, *Killip & Smith* 22666 (S, W).

45b. Besleria variabilis forma **pallida** Morton, f. nov.

A f. *typica* caule herbaceo 0.6–0.9 m alto, corolla viridi-alba differt.

Differs from the typical form in the herbaceous stem 0.6–0.9 m high, and in the greenish-white corolla.

Type in the U. S. National Herbarium, no. 1,359,543, collected in Río Paucartambo Valley, Department of Junín, Peru, altitude 700 meters, June 19, 1929 by E. P. Killip and A. C. Smith (no. 25293).

46. Besleria connata Morton, sp. nov.

Caules et petioli strigosi; lamina foliorum elliptica acuminata membranacea, argute denticulata, subtus praecipue in venis strigillosa; pedunculus communis brevis, pedicellis paucis umbellatis; calyx subcoriaceus, parce externe strigillosus, segmentis supra medium connatis, orbicularibus mucronatis subintegris, margine subscariosis; corolla lutea erecta ecalcarata, utrinque glabra, paullo ventricosa, limbo subbilabiato; ovarium glabrum; discus annularis glaber.

Robust herb, the stems sparsely strigose toward apex; petioles up to 2 cm long, strigose; leaf blades elliptic, up to 12.5 cm long and 5.7 cm wide, sharply acuminate, cuneate at base, membranous, sharply denticulate, glabrous above, strigillose beneath, especially on the veins, the primary veins about 8 pairs; common peduncle short, 5–15 mm long, erect, strigillose, the pedicels 2–4, umbellate, up to 2.5 cm long; calyx 7.5 mm long, sparsely strigillose externally, subcoriaceous, the segments connate to above middle, the tube urceolate, about 5 mm long and 8 mm wide, the lobes orbicular, mucronate below apex, subentire, the margin scarious, ciliolate; corolla yellow, about 20 mm long, erect in calyx, not spurred or saccate at base, the tube glabrous on both sides, a little ventricose upwardly, the throat contracted, the limb terminal, subbilabiate; androecium glabrous; ovary and style glabrous; disk annular, glabrous.

Type in the Field Museum, no. 684,043, collected on Río Claro, Venezuela, altitude 1,360 meters, February 1931, by José Saer (no. 783).

From *Besleria affinis* the present species differs in its smaller leaves with fewer lateral veins, in its very short peduncle, bearing only a few pedicels, and in its

larger, coriaceous calyx. From *B. mucronata* it differs in its denticulate rather than serrulate leaf blades, and its thicker, larger calyx, with the lobes connate to above the middle. In *B. mucronata* the calyx lobes are almost free.

47. Besleria mucronata Hanst. Linnaea **34**: 330. 1865.

Shrub to 1.8 m high; stems strigillose when young; petioles up to 4 cm long, finely strigillose; leaf blades lance-elliptic, up to 12.5 cm long and 4.5 cm wide, short-acuminate, cuneate at base, serrulate, membranous, finely strigillose beneath, especially on the veins, the primary veins 5–7 pairs; common peduncles exceeding the petioles, strigillose, several-flowered, or rarely subcorymbosely branched, the pedicels shorter than peduncle, up to 2 cm long; calyx lobes connate near base, suborbicular, orange, about 4 mm long, sparingly puberulous, not venose, broadly rounded, with a conspicuous mucro arising below the apex; corolla red, oblique in the calyx or almost horizontal, not spurred, slightly saccate at base posteriorly, 13–14 mm long, the tube about 5 mm wide, not ventricose, not contracted in throat, glabrous externally, glabrous within or nearly so; androecium glabrous; ovary and style glabrous; disk interrupted anteriorly.

TYPE: Barrúta, Venezuela, February 1856, *Gollmer* (B).

RANGE: Venezuela, at 1,000 to 1,400 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: El Limón, *Pittier* 13503 (F). Hacienda Puerto La Cruz, *Pittier* 8071 (W). Upper Catuche wood, *Pittier* 7158 (W), 9584 (Y). Petaquire, *Fendler* 787 (G, K, Y). Caracas, *Berschel* (K). Colonia Tovar, *Fendler* 2606 (K). Without specific locality, *Eggers* 13221 (Co) *Karsten* s. n. (B).

48. Besleria minutiflora Fritsch, Repert. Sp. Nov. Fedde **18**: 9. 1922.

Herb; stems glabrate quadrangular; petioles 3–5 cm long, thick; leaf blades elliptic, up to 28 cm long and 12 cm broad, nearly entire, narrowed at base, pale beneath, minutely puberulous on veins beneath, the primary veins 16–18 pairs; peduncles equaling the petioles; pedicels numerous, corymbose, 5 mm long, glabrate; calyx in anthesis 2.5 mm long, the lobes nearly free, suborbicular, rounded, ciliate; corolla whitish 5–6 mm long, glabrous, the tube cylindric, not ventricose or ampliate, the lobes subequal, spreading, the limb about 4 mm broad; ovary and style glabrous; disk glabrous, annular.

TYPE: Leticia, Peru, *Ule* 6211 (B).

A peculiar species, without any close affinities. The inflorescence is not duplicated elsewhere in the genus. The common peduncle is subumbellately 3-branched at apex, but the pedicels, instead of being crowded near the apices of these secondary branches as in other species with subcorymbose inflorescences, are borne throughout the length of the branches. The relatively small corollas with entirely cylindric tube and the large, many-veined leaves are also characteristic.

49. Besleria kalbreyeri Fritsch, Repert. Sp. Nov. Fedde **18**: 8. 1922.

Stems nearly glabrous; petioles 5–7 mm long; leaf blades narrowly elliptic, up to 8 cm long and 3 cm broad, entire, cuneate at base, pale beneath, almost glabrous, the veins bearing a few scattered hairs, the primary veins 5 pairs; peduncles 5–7 mm long, glabrous; pedicels few, 12–13 mm long, glabrous; calyx about 5.5 mm long, the lobes nearly free, oblong, obtuse, glabrous; corolla yellow, about 14 mm long, glabrous externally, glabrous within except for a few hairs in throat, not much ventricose, the limb terminal, regular, small; androecium glabrous; ovary puberulent at apex; disk semiannular.

TYPE: Sisabita, Dept. Santander, *Kalbreyer* 1125 (B).

RANGE: Eastern Cordillera of Colombia, at 1,950 to 2,600 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K). Charta, Dept. Santander, *Killip & Smith* 19324 (W, Y).

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50. Besleria clivorum Morton, Proc. Biol. Soc. Washington **48**: 75. 1935.

Shrub; stems densely sericeous; leaf blades elliptic, up to 10.5 cm long and 4 cm wide, entire, cuneate at base, densely but minutely sericeous-strigillose beneath on mesophyll and veins, the primary veins 6 or 7 pairs; peduncles slender, up to 4 cm long; pedicels up to 2 cm long; calyx about 4.5 mm long, the lobes nearly free, ovate, imbricate, entire, not mucronate, evenly strigillose without, glabrous within; corolla yellow, 10–12 mm long, the tube glabrous without and within, not ventricose, the throat glandular within; ovary glabrous; disk annular.

TYPE: El Medio, State of Aragua, Venezuela, *Pittier* 12128 (W).

RANGE: Venezuela, at 600 to 1,400 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (B, Y). Between Carrizal and San Diego, *Pittier* 12982 (W, Y). Colonia Tovar, *Fendler* 2029 (K).

51. Besleria decipiens Morton, sp. nov.

Caules et petioli parce strigillosi; lamina foliorum late elliptica, basi late cuneata, membranacea integerrima, utrinque glabra; pedunculus communis brevis, glaber, pedicellis corymbosis, quam pedunculo longioribus; calycis lobi orbiculares, basi connati, rotundati integri, vix venosi, externe puberuli; corolla aurantiaco-rubra ecalcarata, externe glabra, intus paullo stipitato-glandulosa; androeceum glabrum; ovarium apice puberulum; discus annularis glaber.

Small tree up to 3.6 m high, the stems quadrangular, strigillose at apex, soon glabrous; petioles up to 6 cm long, sparingly strigillose; leaf blades broadly elliptic, up to 22 cm long and 13 cm wide, short-acuminate, broadly cuneate at base, membranous, entire, glabrous on both sides, the primary veins about 6 pairs; common peduncle short, up to 17 mm long, nearly glabrous, the pedicels corymbose, numerous, up to 25 mm long, thickened at apex; calyx lobes orbicular, about 3 mm long, connate at base, scarcely venose, rounded, entire, ciliolate, puberulous externally, the midrib not thickened; corolla orange-red, about 13 mm long, not spurred, slightly ventricose upwardly, becoming 6 mm wide, glabrous on both sides, the throat contracted, somewhat stipitate-glandular within, the limb terminal, the lobes short, erect, glabrous, rounded; androecium glabrous, the anthers coherent; ovary puberulous at apex; style pilosulous; disk annular, entire, glabrous.

Type in the Academy of Natural Sciences, Philadelphia, no. 642,550, collected at La Cumbre, Department of El Valle, Colombia, altitude 1,700–2,100 meters, Sept. 25–27, 1922, by E. P. Killip (no. 11608). Duplicates in the New York Botanical Garden and the U. S. National Herbarium.

52. Besleria tetrangularis Ruiz ex Hanst. Linnaea **34**: 331. 1865.

Herb or small shrub to 1 m high; stem nearly glabrous, quadrangular; petioles sparsely puberulous, up to 6 cm long; leaf blades broadly or narrowly elliptic, up to 14 cm long and 7 cm broad, membranous, subentire, short-acuminate, cuneate at base, puberulous beneath, especially on the veins, primary veins 6–8 pairs; peduncle 5–9 cm long, puberulous; pedicels numerous, puberulous, up to 3 cm long, subcorymbose; calyx lobes orbicular, 4–7 cm long, rounded, not mucronate, ciliolate, puberulous externally, glabrous within, prominently veined; corolla red, 15–17 mm long, prominently ventricose, glabrate or usually puberulent externally, lacking a hairy ring within, contracted in throat, stipitate-glandular within throat; filaments and anthers stipitate-glandular; ovary glabrous; style pubescent; disk glabrous, annular.

TYPE: Vitoc, Peru, *Ruiz & Pavón* in 1794 (B).

RANGE: Peru, at 650 to 900 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (fragment, F). Chanchusmayo, Sandía, *Weberbauer* 1172 (B). Between San Nicolás and Azupizú, Dept. Junín, *Killip & Smith* 26100 (W, Y).

53. Besleria elegans H. B. K. Nov. Gen. & Sp. **2**: 597. 1818.

Shrub; stems pilose-hirtous when young; petioles 5 cm long or more; leaf blades obliquely elliptic-oblong, up to 20 cm long and 8.5 cm wide, acute at base, entire, thick-membranous, nearly glabrous, the veins bearing a few scattered hairs, primary veins 8 or 9 pairs, pilosulous; peduncles shorter than the petioles; pedicels 2 or 3, 12–14 mm long, glabrate; calyx glabrous, about 5 mm long, the lobes united in lower third, subrotund, not mucronate, entire, subcoriaceous, sparsely pilosulous near base, apparently colored, the margin subscarious; corolla scarlet, about 15 mm long, glabrous, cylindric, not ventricose, scarcely contracted in throat, with a hairy ring within near base, the throat glandular within; filaments and anthers glabrous; ovary elongate, glabrous; style glabrous; disk annular, glabrous; berry globular, about 1 cm long and wide.

TYPE: Quebrada de Tochecito, Quindío Region, Colombia, *Humboldt & Bonpland* (B) [6].

54. Besleria rotundifolia Rusby, Mem. Torrey Club **6**: 98. 1896.

Stems densely puberulous when young; petioles 2.5–4.5 cm long; leaf blades broadly elliptic, up to 16 cm long and 11 cm wide, rounded and apiculate at apex, rounded or obtuse at base, slightly denticulate near apex, subtomentose on the veins beneath and the margins, the primary veins 8–10 pairs; peduncles 6–10.5 cm long; pedicels 6–10 mm long; calyx about 6 mm long, the lobes united for about 2 mm, nearly glabrous, obtuse, mucronate, ciliolate; corolla about 12.5 mm long, ventricose, 8.5 mm wide at middle, minutely puberulous externally, with a hairy ring within, glabrous in throat; ovary glabrous; style hairy; disk glabrous, annular.

TYPE: Cochabamba, Bolivia, *Bang* 1250 (Y).

RANGE: Bolivia.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, M, P, W). San Antonio, Dept. Cochabamba, *Werdermann* 2117 (B).

Rusby's description of the fruits is drawn from specimens of *Hoffmannia latifolia* (Bartl.) Kuntze, which is mixed on some sheets with the *Besleria*. In the National Herbarium one entire sheet of *Bang* 1250 is *Hoffmannia*.

55. Besleria concolor Fritsch, Notizbl. Bot. Gart. Berlin **11**: 970. 1934.

Stems sparsely pubescent; petioles minutely pubescent, 1–4 cm long; leaf blades lance-elliptic, up to 20 cm long and 8 cm broad, membranous, subentire, the margins subtomentose, narrowed at base, puberulous on the veins beneath; peduncles pubescent, 3–5 cm long; pedicels up to 5 mm long; calyx orange, 4–5 mm long, the lobes nearly free, oblong-lanceolate, submucronate, subglabrous, unequal, imbricate; corolla orange, barely 10 mm long, puberulous without, with a villous ring within at insertion of stamens, the throat glabrous; ovary glabrous; style hairy above; disk glabrous, annular.

TYPE: Chunchusmayo, Sandía, Peru, *Weberbauer* 1194 (B).

RANGE: Peru, at 900 meters elevation.

Closely related to *B. rotundifolia* Rusby and perhaps not really different.

56. Besleria pallidiflora Fritsch, Notizbl. Bot. Gart. Berlin **11**: 968. 1934.

Herb; stems nearly glabrous; petioles up to 6 cm long; leaf blades lance-elliptic, 6–14 cm long, 2–5 cm wide, membranous, minutely denticulate, cuneate at base, puberulous on the veins beneath; peduncles puberulous, 6–8 cm long; pedicels puberulous, subcorymbose, numerous, 1–2 cm long; calyx 3–4 mm long, the lobes united at base, obtuse, puberulous externally, glabrous within, ciliolate, submu-

[6] Fritsch (Oesterr. Bot. Zeitsch. **62**: 407. 1912) identifies the following collection as of this species: Province of Ocaña, Colombia, altitude 2,400 meters, March 1848, *Schlim* 1692 (Herb. Petrop.).

cronate, not venose; corolla ochroleucous, 10–14 mm long, ventricose at middle (7 mm wide), contracted in throat, externally puberulous, lacking a hairy ring within, stipitate-glandular within throat, the lobes subequal; filaments stipitate-glandular upwardly; anthers stipitate-glandular; ovary glabrous; style pubescent; disk glabrous, annular.

TYPE: Yanangu, Dept. Junín, Peru, *Weberbauer* 2117 (B).

RANGE: Peru, at 2,100 meters elevation.

57. Besleria amabilis Morton, sp. nov.

Caules mox glabri; petioli strigosi; lamina foliorum elliptica integra, margine incrassata, supra parum strigosa, subtus in venis marginibusque strigosis; pedunculus communis brevis, pedicello solitario strigilloso; calycis lobi rotundati, basi connati, coriacei, reticulato-venosi; corolla rubra crassa erecta ecalcarata, tubo cylindrico puberulo, limbo latissimo, lobis magnis inaequalibus; ovarium apice dense villosum; discus annularis glaber.

Shrub with angulate, glabrous stems, the internodes 2 cm long, the nodes conspicuous; petioles up to 1.3 cm long, strigose; leaf blades elliptic, the largest 9 cm long and 4 cm wide, short-acuminate, cuneate at base, entire, the margin thickened, green above, sparingly strigose, paler beneath, the veins and margin strigose, the primary veins about 5 pairs; common peduncle short, the pedicel solitary, 2–2.5 cm long, strigillose; calyx lobes about 6 mm long, 4 mm wide, rounded, connate for 1 mm at base, coriaceous, sparsely pubescent without, glabrous within, reticulate-venose, ciliolate; corolla red, fleshy, erect, not spurred or saccate at base, the tube cylindric, 13 mm long, puberulous externally, the limb terminal, about 15 mm broad, the lobes large, 3 mm long, unequal; androecium glabrous, the anthers connate; ovary glabrous at base, densely villous at apex; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 677,635, collected at Cuesta de las Palmas, southern slope of Cerro de la Horqueta, Province of Chiriquí, Panama, in humid forest, altitude 1,700–2,100 meters, Mar. 17–19, 1911, by H. Pittier (no. 3239).

58. Besleria triflora (Oersted) Hanst. Linnaea **34**: 329. 1865.

Parabesleria triflora Oersted, Centralamer. Gesn. 52. *pl. 6, fig. 1–8.* 1858.

Besleria triflora var. *subcorymbosa* Donn. Smith, Bot. Gaz. **61**: 380. 1916.

Shrub; stems sparingly strigose; petioles strigose, 1.5–3 cm long; leaf blades elliptic, up to 15 cm long and 7 cm broad, usually much smaller, entire, membranous, cuneate at base, nearly glabrous at maturity, the primary veins 5–7 pairs; peduncles variable in length, commonly shorter than the petioles; pedicels umbellate, subcorymbose, usually longer than the peduncle; calyx white at maturity, 5–6 mm long, the lobes free, suborbicular, ciliolate, strigillose externally, the margin subscarious; corolla orange-red, about 15 mm long, puberulent without, the limb about 7 mm broad, scarcely wider than the corolla tube; ovary hairy; disk annular; berry white.

TYPE: Turrialba, Prov. Cartago, Costa Rica, *Oersted* (Co).

RANGE: Costa Rica, at 1,300 to 2,400 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Tuis, Prov. Cartago, *Tonduz* 11511 p.p. (W). La Palma, Prov. San José, *Standley* 38071 (W); *Tonduz* 7453 (F, G, W, Y), type of var. *subcorymbosa; Maxon & Harvey* 8012 (W). La Hondura, Prov. San José, *Standley* 26274 (W), 37707 (W); *M. Valerio* 700 (F). Cerro de las Caricias, Prov. Heredia, *Standley & Valerio* 52005 (W), 52035 (W). Yerba Buena, Prov. Heredia, *Standley & Valerio* 49031 (W), 49189 (W), 49233 (W), 49257 (W), 49745 (W). Orosi, *Standley* 39813 (W). El Muñeco, Prov. Cartago, *Standley & Torres* 51178 (W); *Stork* 2705 (F). La Estrella, Prov. Cartago, *Standley* 39218 (W). Viento Fresco, Prov

Alajuela, *Standley & Torres* 47767 (W), 47938 (W), 47976 (W). Fraijanes, Prov. Alajuela, *Standley & Torres* 47481 (W), 47686 (W). San Ramón, Prov. Alajuela, *Brenes* 3602 (F), 4184 (F), 4863 (F), 5173 (F), 6030 (F), 6070 (F), 13585 (F). Vara Blanca de Sarapiqui, Prov. Alajuela, *Skutch* 3129 (W).

58a. Besleria triflora var. **australis** Morton, var. nov.

A var. *typica* pedunculo communi brevi, pedicellis solitariis nec umbellatis nec subcorymbosis differt.

Differs from the typical variety in the short common peduncle, the pedicels being solitary, not umbellate or subcorymbose.

Type in the U. S. National Herbarium, no. 934,809, collected above Calote, Department of El Cauca, Colombia, Mar. 18, 1884, by F. C. Lehmann (no. 3774). Duplicate at Kew.

RANGE: Colombia, at 1,700 to 2,100 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: La Cumbre, Dept. El Valle, *Killip & Hazen* 11159 (G, P, W, Y); *Pennell & Killip* 5774 (G, P, W, Y). Vicinity of Medellín, Dept. Antioquia, *Toro* 991 (Y).

59. Besleria formosa Morton, Field Mus. Publ. Bot. **18**: 1151. 1938.

Shrub 1.5–2.5 m high, the stems angulate, strigose, soon glabrous; petioles 1–2 cm long; leaf blades lanceolate, up to 8 cm long and 2.7 cm wide, acuminate, attenuate at base, green above, glabrous or sparsely strigose, pale beneath, glabrous except for the strigose veins, the primary veins about 5 pairs; common peduncle short, up to 7 mm long, the pedicel solitary, 2.5–4 cm long, strigose; calyx lobes coriaceous, obtuse, pale green, glabrous or sparsely strigillose; corolla orange-red, fleshy, 18–19 mm long, not spurred, a little gibbous at base, glabrous on both sides, the limb spreading, narrow, the lobes obtuse; androecium glabrous, the anthers connate; ovary glabrous; style puberulent; disk interrupted on one side, glabrous.

TYPE: Yerba Buena, northeast of San Isidro, Prov. Heredia, Costa Rica, altitude 2,000 meters, *Standley* 49926 (W).

RANGE: Costa Rica, at 2,000 to 2,400 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type locality, *Standley & Valerio* 49839 (W). Cerro de las Caricias, Prov. Heredia, *Standley & Valerio* 52112 (W). Cerro Gallito, *M. Valerio* 1216 (F). Cerro de Zurqui, Prov. Heredia, *Standley & Valerio* 50527 (W), 50695 (W).

Closely related to *B. triflora*, but distinguished by the glabrous corollas and ovaries. The calyces of *B. formosa* are green, those of *B. triflora* white. The present species may also be distinguished from *B. triflora* by the common peduncle bearing only a single pedicel. In *B. triflora* the pedicels are, at least usually, umbellate or subcorymbose.

60. Besleria comosa Morton, sp. nov.

Caules et petioli parce hirsuti; lamina foliorum elliptico-oblonga membranacea integra, supra parce hirsuta, subtus praecipue in venis hirsuta; pedicelli solitarii brevissimi axillares hirsuti; calycis lobi lineari-lanceolati liberi membranacei acuminati, argute serrati, externe hirsuti; corolla coccinea brevis ecalcarata obliqua, vix ventricosa, utrinque longe pilosa; ovarium glabrum; disci glandula postica solitaria oblonga glabra.

Stems subterete, sparsely hirsute; petioles 0.7–3 cm long, sparsely hirsute; leaf blades elliptic-oblong, 7.5–11 cm long, 3–4.7 cm wide, acute or short-acuminate at apex, cuneate at base, membranous, entire, sparsely hirsute above, hirsute beneath, especially on the veins, the primary veins 7–9 pairs; common peduncle none; pedicel solitary, axillary, 2–3 mm long, hirsute; calyx lobes linear-lanceolate, 14 mm long, free, membranous, acuminate, sharply serrate, hirsute without,

glabrous within; corolla scarlet, scarcely longer than calyx, about 14.5 mm long, oblique in calyx, not spurred at base, the tube scarcely ventricose, about 5 mm wide, long-pilose on both sides, the throat a little contracted, the limb terminal, the lobes erect, rounded, equal; androecium glabrous, the filaments contorted, the anther cells confluent; ovary glabrous; style pilosulous; disk reduced to a solitary, oblong, glabrous, posterior gland, this 2.5 mm long.

Type in the U. S. National Herbarium, no. 1,196,567, collected between Baños and Cashurco, Valley of Pastaza River, Province of Tungurahua, Ecuador, altitude 1,300–1,800 meters, Sept. 25, 1923, by A. S. Hitchcock (no. 21870).

61. Besleria mirifica Morton, sp. nov.

Caules et petioli dense hirsuti; lamina foliorum elliptica magna, cuspidato-acuminata, basi late cuneata, membranacea, fere usque ad basin serrata, utrinque pilosa, in venis hirsuta; pedicelli breves glabri; calycis lobi lanceolati subaequales, fere liberi, externe parce puberuli, intus glabri, sub apice mucronati, mucrone subulato longissimo densissime hirsuto, pilis longissimis; corolla lutea vel aurantiaca, subobliqua ecalcarata ventricosa, externe pilosula, intus glabra, in fauce glandulosa; ovarium glabrum; discus annularis glaber.

Slender shrub about 2 m high, the bark rugose, the stems somewhat quadrangular, about 5 mm in diameter, very densely hirsute; petioles elongate, up to 7 cm long, densely hirsute; leaf blades elliptic, up to 30 cm long and 11.7 cm wide, cuspidate-acuminate, broadly cuneate at base, membranous, conspicuously serrate to base, persistently pilose on both sides, the veins hirsute beneath, the primary veins 8 or 9 pairs; common peduncle obsolete, the pedicels numerous, aggregate in the leaf axils, about 6 mm long, glabrous; calyx lobes lanceolate, about 4.5 mm long, subequal, nearly free, sparingly puberulous externally, glabrous within, mucronate below the apex, the mucro elongate, 8–9 mm long, very densely long-hirsute, the hairs multiseptate, up to 4 mm long; corolla yellow or orange, 15–16 mm long, oblique in the calyx, not spurred at base, the tube 4 mm in diameter at base, ventricose upwardly, becoming 6 mm wide, the hairs of the outer surface glandular at apex, the throat scarcely contracted, glandular within, the limb terminal, about 7 mm wide, the lobes subequal, semi-elliptic, rounded, about 3 mm long and 2.5 mm wide; filaments glabrous, inserted about 4 mm above base of the corolla tube; anthers connate; ovary and style glabrous; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 1,661,631, collected in the vicinity of Puerto Berrio, between Carare and Magdalena Rivers, Department of Santander, Colombia, altitude 100–700 meters, Aug. 11, 1935, by Oscar Haught (no. 1881). Two additional collections made by Mr. Haught at the same locality are nos. 1623 and 1784.

62. Besleria deflexa (Oersted) Hanst. Linnaea 34: 321. 1865.

Cyrtanthemum deflexum Oersted, Centralamer. Gesn. 56. *pl. 10, fig. 32–39.* 1858.

Shrub (?); stem strigose above; petioles strigose, up to 5 cm long; leaf blades broadly elliptic, asymetric, the pairs unequal, the largest 25 cm long, 10.5 cm wide, long-acuminate at apex and base, obsoletely serrulate, sparsely pilose above with colorless, jointed hairs, strigose on the veins beneath, primary veins about 10 pairs; pedicels 5 mm long; calyx lobes very unequal, linear-lanceolate, the upper about 22 mm, exceeding the corolla, the other four shorter, subequal, 13–17 mm long, subappressed-pubescent; corolla abruptly deflexed at base, ventricose, glabrous; stigma not bilobed; disk half encircling the ovary.

Type: Tintalcingo, Lobani, Chinantla, State of Puebla, Mexico, *Liebmann* (Co).

Range: Mexico.

Additional specimens examined: Type collection (W). Comaltepec, State of Oaxaca, *Liebmann* (Co).

63. Besleria cyrtanthemum Hanst. Linnaea **34**: 321. 1865.

Cyrtanthemum hirsutum Oersted, Centralamer. Gesn. 56. *pl. 10, fig. 20–31.* 1858. Not *B. hirsuta* Hanst.

Shrub; stems angled, sparsely pilose below, conspicuously hirsute toward apex; petioles 2.5–3 cm long, sparsely pilose; leaf blades long-elliptic, oblique, the largest about 29 cm long, 11 cm wide, narrowly acuminate at both ends, obsoletely serrulate, sparsely pilose above with colorless jointed hairs, hirsute beneath, especially on the veins, primary veins about 10 pairs; pedicels about 7 mm long, densely pilose; calyx lobes linear-lanceolate, very unequal, the upper about 20 mm long, hirsute outside, glabrous within, the four lower lobes subequal, about 12 mm long; corolla (color unknown) sharply deflexed at base, not spurred, 17–18 mm long, glabrous, markedly ventricose (about 7 mm wide at the broadest place), the throat contracted, the lobes small, obtuse, unequal; disk described as half encircling the ovary.

TYPE: St. Jago Amatlan, State of Oaxaca, Mexico, *Liebmann* (Co).

RANGE: Mexico.

ADDITIONAL SPECIMENS EXAMINED: Type collection (F, W). Lacoba, Chinantla, State of Puebla, *Liebmann* (Co). Comaltepec, State of Oaxaca, *Liebmann* (Co).

64. Besleria tuberculata Morton, sp. nov.

Caules et petioli dense rubro-hirsuti; lamina foliorum elliptico-oblonga acuta, basi obtusa, subcoriacea crenulata, supra longe tuberculata, tuberculis apice piliferis, subtus dense hirsuta; pedicelli hirsuti; calycis lobi ad medium connati, lanceolati integri membranacei, utrinque longe hirsuti, apice filiformes; corolla rubra parva ecalcarata, externe parce hirsuta, intus faucem versus stipitato-glandulosa, lobis longe ciliatis; ovarium dense villosum; discus annularis glaber.

Herb about 1.5 m high, the stems densely red-hirsute; petioles 5–7 mm long, densely hirsute; leaf blades elliptic-oblong, 7–9 cm long, 2.5–3.8 cm wide, acute, obtuse at base, subcoriaceous, crenulate, long-tuberculate on the upper surface (the tubercles piliferous at apex), densely hirsute beneath, the primary veins about 8 pairs; common peduncle obsolete, the pedicels numerous, about 10 mm long, hirsute; calyx about 10 mm long, the lobes lanceolate, connate to middle, membranous, entire, filiform at apex, long-hirsute on both sides; corolla red, about 13 mm long, erect, not spurred or saccate at base, the tube about 5 mm wide, scarcely ventricose, sparingly hirsute externally, glabrous within at base, stipitate-glandular toward throat, the throat contracted, the limb terminal, the lobes subequal, long-ciliate; androecium glabrous; ovary densely villous; style pilosulous; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 1,482,429, collected in the region of Mount Chapón, Department of Boyacá, Colombia, altitude 2,250 meters, May 23, 1932, by A. E. Lawrance (no. 102). Duplicate at Stockholm.

In the tuberculate upper surfaces of the leaves this species is similar to *B. laeta*, but in floral characters the two species are quite unlike.

65. Besleria columneoides Hanst. Linnaea **34**: 322. 1865.

Stems densely hirsute; petioles 2.5 cm long, hirsute; leaf blades elliptic, up to 22.5 cm long and 8.5 cm wide, cuneate at base, hirsute beneath especially on the veins, the primary veins 8 or 9 pairs; pedicels 0.8–1.4 cm long; calyx yellow, 10 mm long, the lobes free, lanceolate, acuminate, externally long-pilose, glabrous within, bearing 2–4 subulate teeth; corolla scarcely longer than calyx, 4 mm wide, copiously red-villous, the lobes glabrous externally, long-ciliate; ovary villous at apex; disk subentire.

TYPE: San Miguel, Costa Rica, May 14, 1857, *Wendland* 762 (B).

66. Besleria ignea Fritsch, Notizbl. Bot. Gart. Berlin **11**: 966. 1934.

Herb or shrub, 0.6–1.5 m high; stems densely appressed-pilose; petioles appressed-pilose, short, up to 4 cm long; leaf blades oblanceolate, up to 22 cm long and 9 cm wide, subentire, long-decurrent at base into the petiole, strigillose on the veins beneath, primary veins 5–8 pairs; pedicels up to 1 cm long; calyx orange, about 15 mm long, the lobes free, lanceolate, acute, entire, densely sericeous-pilose without, glabrous or sparingly pubescent within; corolla orange, 20–27 mm long, ventricose, nearly glabrous without, or sparingly pilosulous, with a pilose ring within at the insertion of the filaments, the lobes conspicuously long-ciliate; ovary glabrous; style hairy; disk annular but enlarged posteriorly, glabrous.

TYPE: Leticia, Dept. Loreto, Peru, *Ule* 6182 *** (B).

RANGE: Peru and Amazonian Brazil, at 375 to 625 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

PERU: Puerto Yessup, Dept. Junín, *Killip & Smith* 26230 (W). Santa Rosa, Dept. Junín, *Killip & Smith* 26154 (W). Puerto Bermudez, Dept. Junín, *Killip & Smith* 26427 (W), 26466 (W), 26517 (W), 26536 (W).

BRAZIL: Paranagua, Basin of the Rio Juruá, State of Amazonas, *Krukoff* 4553 (S, Y).

66a. Besleria ignea var. **mexiae** Morton, var. nov.

A var. *typica* petiolis longioribus (7–10 cm), laminis ellipticis nec oblanceolatis differt.

Differs from the typical variety in the longer petioles (7–10 cm) and the elliptic rather than oblanceolate leaf blades.

Type in the U. S. National Herbarium, no. 1,664,491, collected on trail from Rancho Indiana to Río Napo, Department of Loreto, Peru, altitude 110 meters, Jan. 27, 1932, by Ynes Mexía (no. 6447a). Duplicate in the Field Museum.

66b. Besleria ignea var. **loretensis** Morton, var. nov.

A var. *typica* caulibus, petiolis venisque patente hirsutis nec appresso-pilosis differt.

Differs from the typical variety in the spreading-hirsute pubescence of the stems, petioles, and veins.

Type in the U. S. National Herbarium, no. 1,461,940, collected between Yurimaguas and Balsapuerto, lower Río Huallaga basin, Department of Loreto, Peru, altitude 135–150 meters, Aug. 26–31, 1929, by E. P. Killip and A. C. Smith (no. 28337).

RANGE: Peru, at 100 to 350 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type locality, *Killip & Smith* 28418 (W). Iquitos, *Killip & Smith* 26935 (W), 27353 (W), 29855 (W). San Antonio, on Río Itaya, *Killip & Smith* 29489 (W). Soledad, on Río Itaya, *Killip & Smith* 29637 (W), 29814 (W).

66c. Besleria ignea var. **semiannularis** Morton, var. nov.

A var. *typica* disco semiannulari nec annulari, foliis subtus ubique molliter pilosis, venis hirsutis differt.

Differs from the typical variety in the leaf blades being hirsute on the veins and soft-pilose beneath on the surface, and in its semiannular not annular disk.

Type in the U. S. National Herbarium, no. 1,495,925, collected at Florencio, Caquetá, Colombia, December 1930, by E. Pérez Arbelaez (no. 751B).

67. Besleria petiolaris (Griseb.) Urban, Symb. Antill. **2**: 352. 1901.

Collandra petiolaris Griseb. Fl. Brit. W. Ind. 463. 1861.

Stems densely pilose-subtomentose; petioles 2.5–6 cm long; leaf blades obovate or obovate–elliptic, 17–26 cm long, 9–11 cm wide, subcoriaceous, subentire,

broadly cuneate at base, pilosulous beneath, especially on the veins, the primary veins 9–14 pairs; pedicels densely villous, 4–6 mm long; calyx 9–12 mm long, the lobes narrowly lanceolate, long-acuminate, entire, free, villous on the back; corolla 12 mm long, glabrous; ovary glabrous; disk annular.

TYPE: Dominica, *Imray* 199 (K).

RANGE: Dominica.

Urban (loc. cit.) mentions *Imray* 298 and *Nicholls* 8, both from Dominica.

68. Besleria robusta Donn. Smith, Bot. Gaz. **25**: 156. 1898.

Shrub; branches 8–10 mm thick, densely tomentose; petioles 2.5–5.5 cm long, thick; leaf blades obovate, up to 32 cm long and 17.5 cm wide, subcoriaceous, entire, cuneate at base, subtomentose on the veins beneath and the margins, the primary veins 11 or 12 pairs; pedicels densely sericeous, 6–10 mm long, elongating in fruit; calyx 10–12 mm long, the lobes free, oblong-ovate, acute, coriaceous, entire, densely sericeous without, glabrous within; corolla orange, 9–14 mm long, ventricose, glabrous except for the glandular throat within; ovary glabrous; disk annular.

TYPE: Tsaki, Prov. Limón, Costa Rica, *Tonduz* 9556 (W).

RANGE: Costa Rica and Panama, at 200 to 500 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Guápiles, Prov. Limón, *Standley* 37065 (W), 37318 (W).

PANAMA: Buena Vista Camp, on Chiriquí Trail, *Cooper* 584 (F, Y).

69. Besleria citrina Fritsch, Notizbl. Bot. Gart. Berlin **11**: 963. 1934.

Stems subquadrangular, sparsely strigose; petioles 2–4.5 cm long, strigose; leaf blades oblong-oblanceolate, 15–20 cm long, 4–5 cm wide, cuneate at base, rather thick, entire, strigose beneath on the veins, the primary veins about 8 pairs; common peduncle obsolete, the pedicels very short, about 4 mm long, strigose; calyx lobes lemon-yellow, ovate, 6–8 mm long, acutish, entire, sparingly pilose without, glabrous within; corolla lemon-yellow, erect, not saccate at base, externally villous, lacking a hairy ring within, the limb terminal; androecium glabrous; ovary puberulous at apex; disk annular, glabrous.

TYPE: Moyobamba, Dept. Loreto, Peru, *Weberbauer* 4618 (B).

RANGE: Peru, at 1,000 to 1,100 meters elevation.

70. Besleria membranacea Morton, sp. nov.

Caules et petioli sparse strigosi; lamina foliorum elliptica vel ovato-elliptica, basi attenuata, membranacea integra, supra glabra, subtus praecipue in venis puberula; pedicelli pauci glabri; calycis lobi ovato-lanceolati liberi acuti integri, tenuiter membranacei, fere glabri; corolla flava et alba, erecta ecalcarata, paullo ventricosa, utrinque glabra; ovarium glabrum; discus annularis glaber.

Shrub 1 m high, the stems sparsely strigose toward apex; petioles elongate, up to 11.5 cm long, sparsely strigose; leaf blades elliptic or ovate-elliptic, up to 16 cm long and 7.5 cm wide, attenuate at base, membranous, entire, glabrous above, puberulous beneath, especially on the veins, the primary veins 8 or 9 pairs; common peduncle obsolete, the pedicels few, about 2 cm long, glabrous; calyx lobes ovate-lanceolate, in anthesis 9 mm long and 4.7 mm wide, becoming somewhat larger in age, free, acute, not mucronate, entire, thin-membranous, nearly glabrous without, glabrous within; corolla yellow and white, about 18 mm long, erect, not spurred or saccate at base, the tube 5 mm wide at base, a little ventricose upwardly, becoming 7 mm wide, glabrous on both sides, the limb terminal, the lobes erect, subequal; androecium glabrous; ovary glabrous; disk annular, glabrous.

Type in the Field Museum, collected at Chazuta, Río Huallaga, Department of San Martín, Peru, altitude 260 meters, March 1935, by G. Klug (no. 3994). Duplicates in the Gray Herbarium and U. S. National Herbarium.

RANGE: Amazonian Peru.

ADDITIONAL SPECIMEN EXAMINED: Río Mayo, near Tarapoto, Dept. San Martín, *Spruce* s. n. (K).

71. Besleria cuneata Gardn. in Lond. Journ. Bot. 1: 543. 1846.

Stems sparingly strigillose; petioles 2.5–4 cm long, glabrate; leaf blades oblanceolate or elliptic, up to 18 cm long and 7.5 cm wide, cuneate at base, membranous, entire, minutely strigillose on the veins beneath, the primary veins 7 or 8 pairs; pedicels 5 mm long or less, strigillose; calyx lobes yellow, ovate, about 8.5 mm long, rounded or obtuse, not mucronate, imbricate, nearly free, membranous, entire, sparingly pilosulous externally, ciliate, glabrous within; corolla yellow, not twice as long as calyx, not spurred, sparsely pilosulous; ovary glabrous; disk annular, glabrous.

TYPE: Corcovado, State of Rio de Janeiro, Brazil, *Gardner*.

RANGE: State of Rio de Janeiro, Brazil.

SPECIMENS EXAMINED: Corcovado, *Mosén* 2762 (S); *Dusén* 5087 (S).

72. Besleria melancholica (Vell.) Morton, comb. nov.

Orobanche melancholica Vell. Fl. Flum. 260. 1825; Ic.6: *pl. 77*. 1827.

Besleria geminiflora Gardn. in Lond. Journ. Bot. 1: 542. 1846.

Besleria riedeliana Hanst. in Mart. Fl. Bras. 8[1]: 399. 1864.

Stems strigillose or subappressed-pilose at apex; petioles up to 5 cm long; leaf blades elliptic or oblanceolate, up to 18 cm long and 8 cm wide, cuneate at base, membranous, entire, glabrate above, puberulous on the veins beneath, the primary veins 8–10 pairs; pedicels few, 12–17 mm long, strigillose; calyx lobes lanceolate or ovate-lanceolate, 12–17 mm long, acute, membranous, imbricate, entire, strigillose externally, glabrous within; corolla yellow or whitish, about 22 mm long, erect, not spurred or saccate at base, the tube scarcely ventricose, about 8 mm wide, pilosulous externally, lacking a hairy ring within; androecium and gynoecium glabrous; disk annular, glabrous.

TYPE: State of Rio de Janeiro, Brazil, *Velloso*.

RANGE: State of Rio de Janeiro, Brazil.

SPECIMENS EXAMINED: Corcovado, *Gardner* 246 (K); *Dusén* 197 (S); *Pohl* (F); Tijuca, *Dusén* 14359 (F, S). Rio de Janeiro, *Miers* 3087 (K); *Widgren* (S); *Regnell* 174 (S); *Riedel* s. n. (Co, K, W). Without special locality, *Widgren* 662 (S); *Freyreiss* (S); *Talbot* (K); *Wilkes Expedition* (W).

73. Besleria symphytum Hanst. in Mart. Fl. Bras. 8[1]: 399. 1864.

Stems hirto-villous; petioles villous, up to 4 cm long; leaf blades elliptic-ovate, up to 20 cm long and 10 cm wide, cuneate at base, membranous, entire, hirsute on both sides, the primary veins 9 or 10 pairs; pedicels numerous, short, hirsute; calyx lobes broadly ovate, 12–16 mm long, 7–9 mm wide, short-acuminate, imbricate, membranous, entire, setose-villous on both surfaces; corolla and genitalia not known.

TYPE: Rio de Janeiro, *Lhotzky* (photograph, F).

I have seen no specimens of this species, which is said to differ from *B. melancholica* in having the calyx lobes hairy on both surfaces. This point is not clear from the photograph I have seen. Specimens which have been so determined have been found referable to *B. melancholica*.

74. Besleria meridionalis Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum elliptica, breviter acuminata, basi angustata, membranacea, apicem versus serrata, utrinque hirsuta; pedicelli solitarii vel bini, elongati, parce hirsuti; calycis lobi anguste oblongi, liberi, non imbricati, integri, paullo mucronati, externe in linea media sparse pilosuli; corolla lutea erecta ecalcarata ventricosa, utrinque glabra; ovarium glabrum; discus annularis glaber.

Stems densely hirsute; petioles up to 4 cm long, hirsute; leaf blades elliptic, up to 7.5 cm long and 3.5 cm wide, short-acuminate at apex, narrowed at base, membranous, serrate toward apex, hirsute on both sides, the primary veins 6 or 7 pairs; common peduncle obsolete, the pedicels solitary or paired, elongate, 3–4.5 cm long, sparsely hirsute, thickened toward apex; calyx lobes narrowly oblong, 9–10 mm long, free, not imbricate, entire, a little rounded and mucronate at apex, pilosulous externally in a median line, glabrous within; corolla yellow, 15–18 mm long, erect, not spurred, the tube 5 mm wide at base, ventricose upwardly, becoming 9 mm wide, glabrous on both sides, the throat contracted, the limb terminal, narrow, regular; androecium glabrous; ovary and style glabrous; disk annular, glabrous.

Type in the Kew Herbarium, collected near Papagaio, State of Minas Geraes, Brazil, October 1840, by Gardner (no. 4974).

The type sheet bears the erroneous number 4976. The correct data are given on a duplicate sheet in the Kew Herbarium which bears Gardner's original label

75. Besleria fasciculata Wawra, Oesterr. Bot. Zeitschr. **13**: 142. 1863.

Stems hirsute; petioles up to 4.5 cm long, hirsute; leaf blades oblanceolate, up to 23 cm long and 11 cm wide, cuneate at base, membranous, entire, glabrate above, hirsute beneath, the primary veins 6–9 pairs; common peduncle obsolete, the pedicels numerous, 10–12 mm long, hirsute; calyx lobes ovate-lanceolate, 12–17 mm long, acute, not mucronate, membranous, entire, hirsute without, glabrous within; corolla whitish or pale yellow, erect, not spurred, pilose externally; ovary and style glabrous; disk annular, glabrous.

Type: Corcovado, State of Rio de Janeiro, Brazil, *Wawra* (photograph, W).

Range: State of Rio de Janeiro, Brazil.

Additional specimens examined: Rio de Janeiro, *Riedel* (W); *Widgren* 1323 (S).

76. Besleria disgrega Morton, Proc. Biol. Soc. Washington **48**: 74. 1935.

Shrub; stems hirsute; petioles hirsute, up to 6 cm long; leaf blades ovate or elliptic, up to 19 cm long and 8.5 cm wide, membranous, denticulate, cuneate at base, ciliate, hirsute on the veins beneath, the primary veins 7–9 pairs; pedicels numerous, hirsute, about 7 mm long; calyx about 14 mm long, the lobes linear-lanceolate, carinate, entire, hirsute on both sides; corolla white, 15–18 mm long, lightly puberulent without, glabrous within, the throat glandular; ovary glabrous; disk annular.

Type: El Portachuela, State of Aragua, Venezuela, *Pittier* 11810 (W).

Range: Venezuela.

Additional specimens examined: Type collection (Y). Alto de Rancho Grande, *Pittier* 12151 (W, Y). El Portachuela, *Pittier* 11367 (W). Colonia Tovar, *Fendler* 2030 (K). Puerto La Cruz, *Jahn* 1324 (W).

77. Besleria furva Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum oblique ovata, magna, abrupte acuminata, apicem versus denticulata, basi rotundata, utrinque hirsuta; pedicelli in axillis foliorum aggregati, hirsuti; calycis lobi ovato-lanceolati, basi connati, vix dentati, acuminati, externe hirsuti; corolla alba erecta ecalcarata, vix ventricosa, glabra; ovarium glabrum; discus annularis glaber.

Stems quadrangular, hirsute; petioles up to 9 cm long, hirsute; leaf blades obliquely ovate, up to 24 cm long and 13 cm wide, abruptly acuminate, unequally rounded at base, denticulate toward apex, hirsute on both sides, the primary veins 8–10 pairs; common peduncle obsolete; pedicels aggregate in the leaf axils, about 15 mm long, hirsute; calyx lobes ovate-lanceolate, about 11 mm long, connate at base, acuminate, slightly dentate, hirsute without, glabrous within; corolla white, 13 mm long, erect, not spurred, scarcely ventricose, glabrous, the limb terminal, the lobes erect, rounded; ovary and style glabrous; disk annular, entire, glabrous.

Type in the Kew Herbarium (2 sheets), collected at Tarapoto, Department of San Martín, Peru, on tree trunks, January 1857, by R. Spruce (no. 4955).

78. Besleria riparia Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum late elliptica, acuta, basi rotundata vel late cuneata, membranacea, remote crenata vel fere integra, supra hirsuta, subtus imprimis in venis hirsuta; pedicelli solitarii graciles fere glabri; calycis lobi lineari-lanceolati liberi, longe acuminati, integri, externe hirsuti, intus glabri; corolla aurantiaca erecta ecalcarata ventricosa, externe pilosa, intus annulo piloso basi praedita; ovarium glabrum; discus annularis glaber.

Shrub 1–1.5 m high, the stems hirsute upwardly, glabrescent below; petioles up to 2.5 cm long, hirsute; leaf blades broadly elliptic, up to 10.5 cm long and 5.5 cm wide, acute, rounded or broadly cuneate at base, membranous, remotely crenate or nearly entire, hirsute above, hirsute beneath, especially on the veins, the primary veins 8–12 pairs; common peduncle obsolete, the pedicels solitary in the leaf axils, slender, about 2.5 cm long, nearly glabrous; calyx lobes linear-lanceolate, free, about 13 mm long, 2.5 mm wide at base, long-acuminate, entire, hirsute externally, glabrous within; corolla orange, about 16 mm long, not spurred at base, erect, ventricose upwardly, becoming 9 mm wide, pilose externally, bearing a pilose annular ring within at the insertion of the filaments, the throat contracted, about 5 mm wide, the limb terminal, the lobes small, erect, rounded, subequal, about 1.5 mm long; anthers connate; ovary glabrous; style puberulous; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 531,413, collected near Río Flautas, Río Paez Valley, Tierra Adentro, Department of Huila, Colombia, altitude 2,700 meters, Jan. 26, 1906, by H. Pittier (no. 1219).

There is in the National Herbarium a second specimen of the same species collected at the same place (*Pittier* 1212). A specimen with obtusish, relatively broader, more hirsute leaves, perhaps to be referred here, was collected on Mount Derrumbo, Dept. of El Cauca, altitude 2,500–2,900 meters, July 1, 1922, by E. P. Killip (no. 7996).

79. Besleria impressa Morton, sp. nov.

Caules subappresso-pilosi; lamina foliorum oblonga, basi rotundata, chartacea integra, supra subglabra, subtus praecipue in venis hirsuta, venis primariis supra valde impressis; pedicelli plurimi breves; calycis lobi lanceolati liberi, longe acuminati, nervosi, externe pilosi, ciliati; corolla erecta, ecalcarata, sursum ventricosa, externe sparse pilosa, intus glabra; ovarium glabrum; discus uno latere interruptus.

Shrub with angled, subappressed-pilose stems; petioles short, scarcely 5 mm long; leaf blades oblong, up to 10 cm long and 3.3 cm wide, acuminate, rounded at base, chartaceous, entire, subglabrous above, hirsute beneath, especially on the veins, the primary veins 9–15 pairs, strongly impressed above, elevated beneath; common peduncle obsolete, the pedicels numerous, 6–7 mm long; calyx lobes lanceolate, 7.5 mm long, free, long-acuminate, veiny, pilose externally, glabrous within, ciliate; corolla erect, 10–14 mm long, not spurred or gibbous at base, 3 mm wide at base, ventricose upwardly and becoming 5 mm wide, minutely puberulous at base, sparsely pilose upwardly, glabrous within, the limb terminal, the lobes small, equal; androecium glabrous; ovary and style glabrous; disk glabrous, interrupted on one side; berry 5–6 mm in diameter, the style base persistent.

Type in the U. S. National Herbarium, no. 1,423,128, collected at Villavicencio, Department of Meta, Colombia, altitude 2,500 meters, by M. T. Dawe (no. 263). A duplicate is in the Kew Herbarium.

RANGE: Eastern Cordillera of Colombia, at 1,200 to 2,000 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Buena Vista to Villavicencio, *Pérez Arbelaez* (W). Susumuco, south of Quetamé, Dept. Cundinamarca, *Pennell* 1367 (W, Y).

80. Besleria immitis Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum lanceolata vel elliptico-lanceolata, apice attenuata, basi anguste cuneata, membranacea, leviter serrata, utrinque hirsuta; pedicelli numerosi in axillis foliorum, breves; calycis lobi lineares liberi integri, externe hirsuti, intus glabri; corolla ferrugineo-rubra erecta ecalcarata tubulosa, vix ventricosa, externe hirsuta, intus annulo piloso instructa, intus in fauce glabra; filamenta brevia, basi pilosa; ovarium pilosum; discus annularis, postice crassus.

Shrub 1.5 m high, the stems terete, densely hirsute; petioles slender, up to 5.5 cm long, hirsute; leaf blades lanceolate or elliptic-lanceolate, up to 19 cm long and 6.8 cm wide, attenuate at apex, narrowly cuneate at base, membranous, lightly serrate, hirsute on both sides, the primary veins 7–9 pairs; calyx lobes linear, free, 10–11 mm long, about 1.5 mm wide, at length becoming 15 mm long, entire, hirsute externally, glabrous within; corolla brick-red, about 13 mm long, erect, not spurred, tubular, scarcely ventricose, about 6 mm wide, the throat scarcely contracted, the limb terminal, the lobes erect, rounded, small; filaments short, pilose at base; ovary pilose; style pilosulous; disk annular, very low anteriorly, thickened posteriorly, glabrous; berry shining, pilose at apex.

Type in the U. S. National Herbarium, no. 1,518,072, collected at Umbría, 6°54′ N., 76°10′ W., Comisaría del Putumayo, Colombia, altitude 325 meters, January–February, 1931, by G. Klug (no. 1912). Duplicate at Stockholm.

RANGE: Amazonian Colombia and Peru.

ADDITIONAL SPECIMENS EXAMINED:

PERU: Florida, Río Putumayo, Dept. Loreto, *Klug* 2231 (S, W). ? Río Santiago, Pongo de Manseriche, Dept. Loreto, *Mexia* 6245 (F).

81. Besleria compta Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum elliptico-lanceolata, acuminata, basi cuneata, membranacea integra, utrinque hirsuta; pedicelli in axillis foliorum aggregati, hirsuti; calycis lobi ovato-lanceolati, basi connati, acuminati, serrati, externe hirsuti, intus glabri, ciliati; corolla flava erecta ecalcarata, vix ventricosa, superne dense hirsuta, tubo intus glanduloso, annulo piloso nullo; ovarium pilosulum; discus annularis glaber.

Shrub 1 m high, the stems terete, densely hirsute; petioles up to 7 cm long, slender, hirsute; leaf blades elliptic-lanceolate, up to 17.5 cm long and 7 cm wide, acuminate, cuneate at base, membranous, entire, hirsute on both sides, ciliate; common peduncle obsolete, the pedicels aggregate in the leaf axils, about 12 mm long, hirsute; calyx lobes ovate-lanceolate, about 11 mm long, 5 mm wide at base, irregular, connate at base, acuminate, serrate, hirsute externally, glabrous within, ciliate; corolla pale yellow, about 19 mm long, erect, not spurred at base, hardly ventricose, about 7 mm wide, densely hirsute without, glabrous within, the throat not contracted, the limb terminal, the lobes erect, rounded, about 4 mm long, eglandular within; filaments about equaling the corolla tube, glabrous; staminodium well developed; ovary and style pilosulous; disk annular, entire, glabrous.

Type in the U. S. National Herbarium, no. 1,457,306, collected at Balsapuerto, Department of Loreto, Peru, altitude 220 meters, February 1933, by G. Klug (no. 2926). Duplicates at Berlin, Kew, Gray Herbarium, and Stockholm.

RANGE: Eastern Peru at low elevations.

ADDITIONAL SPECIMENS EXAMINED: Tarapoto, Dept. San Martín, *Spruce* 4564 (K). Campana, *Spruce*, s. n. (K).

The last specimen was cited by Britton as *Besleria sprucei* and formed the basis for the specific name, but *Rusby* 2149 was definitely cited as the type. The Rusby and Spruce plants are obviously different and belong in different subsections. The Spruce specimen is not in condition to dissect but seems to be conspecific with *Klug* 2926 and *Spruce* 4564.

82. Besleria capitata Poepp. Nov. Gen. & Sp. 3: 2. 1845.

Stems hirsute; petioles up to 4 cm long; leaf blades elliptic-oblong, up to 13 cm long and 6 cm wide, short-acuminate, cuneate at base, ciliate, hirsute beneath, especially on the veins, primary veins about 10 pairs; peduncles hirsute, longer than the petioles; pedicels subracemose, short; calyx orange, lobes free, oblong-lanceolate, about 11 mm long, hirsute externally, glabrous within, subentire, with a long mucro arising below the apex; corolla yellow, fleshy, about 13 mm long, the tube not saccate at base, erect, scarcely ventricose, the lobes small, subequal, densely pilose externally, not ciliate, the tube with a hairy ring within at insertion of filaments, glandular within throat; filaments pubescent upwardly; anthers sparingly pubescent; ovary pilosulous at apex; style pubescent; disk annular, fleshy, glabrous.

TYPE: Cochero, Peru, *Poeppig* 1622 (photograph, W).

SPECIMEN EXAMINED: Type locality, *Poeppig* 1623 (B).

83. Besleria racemosa Morton, sp. nov.

Caules et petioli tomentoso-villosi; lamina foliorum obovata vel late elliptica, rotundata, basi obliqua rotundata, chartacea, crenulata, supra parce pilosa, subtus in venis hirsuta; pedunculus communis elongatus crassus hirsutus, pedicellis racemosis crassissimis hirsutis; calycis lobi oblongi, fere liberi, coriacei rotundati serrulati, sub apice breviter mucronati, externe villosuli, intus glabri; corolla ferruginea erecta ecalcarata ventricosa, externe minute sed dense hirto-puberula, intus basin versus pilosa, lobis externe hirtis; ovarium apice pilosulum; discus annularis glaber.

Herb with fleshy stems about 1 cm in diameter, these quadrangular, densely tomentose-villous at apex; petioles fleshy, 1–3 cm long, densely tomentulose-villous; leaf blades obovate or broadly elliptic, 17–26 cm long, 8–15 cm wide, rounded, oblique and rounded at base, chartaceous, crenulate, sparsely pilose above, hirsute on the veins beneath, glabrous on the leaf surface, the primary veins 13–15 pairs; common peduncle elongate, 9–15 cm long, thick, hirsute, the pedicels racemose, 1–1.5 cm long, very thick, hirsute; calyx lobes oblong, in anthesis about 10 mm long, at length somewhat longer, nearly free (the short tube densely tomentose within), coriaceous, rounded, short-mucronate below apex, serrulate, villosulous externally, glabrous within; corolla brick-red, about 1.5 cm long, erect, not spurred or gibbous at base, the tube 3.5 mm wide at base, ventricose upwardly, becoming 5 mm wide, minutely but densely hirto-puberulous externally, pilose within toward base, the throat contracted, 3 mm wide, the limb terminal, the lobes small, erect, hirtous without, minutely ciliolate; ovary sparingly pilosulous at apex; style pilosulous; disk annular, glabrous.

Type in the Field Museum, collected at Pongo de Cainarachi, Río Cainarachi, Department of San Martín, Peru, altitude 230 meters, September–October 1932, by G. Klug (no. 2660). Duplicate at B, S, W, and Y.

Besleria capitata, *B. racemosa*, and *B. trichiata* form a group well distinguished among Peruvian species by the hirsute-tomentose stems and leaf veins, the elongate peduncle and racemose or subracemose pedicels, and the orange, coriaceous, strongly imbricate calyx lobes. The species themselves are not, however, easy to identify in the absence of flowers. I have seen six additional collections, all lacking corollas, and am unable at present to decide to which if any of the three species they belong. *Besleria capitata* itself is well distinguished by the elongate

mucro arising from the back and much exceeding the apex of the sepal. In the other two species the mucro is short, not reaching the apex of the sepal or almost wanting in *B. trichiata*. As represented by the type specimens *B. racemosa* and *B. trichiata* differ not only in the corollas but also in leaf characters, but I am uncertain as to how much importance to attach to the latter in this group. The dubious specimens of this group are:

PERU: Cahuapanas, Dept. Junín, *Killip & Smith* 26761 (W, Y). San Nicolás, Dept. Junín, *Killip & Smith* 26008 (W, Y). Dos de Mayo, Dept. Junín, *Killip & Smith* 25817 (W), 25822 (W, Y). Enañas, Dept. Junín, *Killip & Smith* 25785 (W). Schunke Hacienda, above San Ramón, Dept. Junín, *Killip & Smith* 24718 (W, Y).

84. Besleria trichiata Morton, sp. nov.

Caules et petioli densissime hirsuti vel hirsuto-tomentosi; lamina foliorum oblique et late elliptica, acuta, basi late cuneata, chartacea opaca subcrenata ciliata, supra parce pilosa, subtus praecipue in venis tomentoso-hirsuta; pedunculus communis hirsutus, pedicellis subracemosis crassis hirsutis; calycis lobi aurantiaci oblongi rotundati subaequales coriacei, sub apice paullo mucronati, externe hirsuti, intus glabri; corolla flava erecta ecalcarata suburceolata, tubo externe glabro, intus annulum pilosum gerente, faucem versus contracto, limbo terminali, lobis perspicue ciliatis; filamenta basi pilosa; ovarium glabrum conicum; discus annularis glaber.

Herb about 30 cm high, the stems not branched, densely hirsute or hirsute-tomentose; petioles up to 2 cm long, hirsute; leaf blades obliquely broad-elliptic, up to 12 cm long and 6.5 cm wide, acute, broadly cuneate at base, chartaceous, opaque, subcrenate, ciliate, green above, sparsely pilose, paler beneath, tomentose-hirsute, especially on the veins, the primary veins 8–11 pairs; common peduncle hirsute, up to 3.5 cm long, the pedicels subracemose, thick, about 6 mm long, hirsute; calyx lobes orange, oblong, 10–11 mm long, about 4.5 mm wide, nearly free, imbricate, coriaceous, rounded, a little mucronate below apex, hirsute externally, glabrous within; corolla yellow, about 16 mm long, erect, not spurred, suburceolate, the tube about 9 mm wide, glabrous externally, bearing a pilose annular ring within at the insertion of the stamens, gradually contracted toward the throat, this about 6 mm wide, the limb terminal, about 7 mm wide, not bilabiate, the lobes small, reflexed, suborbicular, about 1.5 mm long, conspicuously ciliate on the margins; filaments pilose at base; ovary glabrous, conic; style densely pilosulous; disk annular, glabrous.

Type in the U. S. National Herbarium, no. 1,359,999, collected at Porvenir, Pichis Trail, Department of Junín, Peru, altitude 1,500–1,900 meters, July 3–4, 1929, by E. P. Killip and A. C. Smith (no. 25955).

85. Besleria ovalifolia Rusby, Mem. Torrey Club **4**: 240. 1895.

Young stems strigose, the older glabrous; petioles very long (12–14.5 cm), glabrate; leaf blades broadly oval, up to 22 cm long and 13.5 cm broad, membranous, sharply denticulate, abruptly cuspidate at apex, rounded at base, strigillose on the midrib and veins beneath, the primary veins 14 or 15 pairs, arising at a broad angle; peduncle 1.5–2.5 cm long, strigillose; pedicels subcorymbose, numerous, up to 1.5 cm long; calyx up to 12 mm long, the lobes lanceolate, long-acuminate, united to middle; corolla about 15 mm long, ventricose, contracted at throat, puberulous externally, entirely glabrous within; ovary glabrous; disk annular.

TYPE: Songo, Bolivia, *Bang* 862 (Y).

RANGE: Bolivia.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, K, M, P, W).

86. Besleria pauciflora Rusby, Bull. Torrey Club **27**: 31. 1900.

Stems quadrangular, hirsute or hirsutulous; petioles up to 4.5 cm long, hirsute;

leaf blades obliquely elliptic, membranous, up to 21 cm long and 8.5 cm wide, short-acuminate, cuneate at base, sharply serrate, hirsute, especially on the veins beneath, the primary veins 8–10 pairs; common peduncle up to 5 cm long, hirsute, few-flowered, the pedicels subequaling or shorter than the peduncle; calyx lobes linear, laneceolate, membranous, scarcely imbricate, about 10 mm long, long-acuminate, not mucronate, hirsute on both sides; corolla orange or light-red, erect, 14–20 mm long, pilose externally, lacking a hairy ring within, stipitate-glandular upwardly within; androecium glabrous; ovary pilose; style sparingly pilose; stigma bilobed; disk annular, glabrous.

TYPE: Mapiri, Bolivia, *Rusby* 2437 (Y).

RANGE: Panama, Colombia, and Bolivia.

ADDITIONAL SPECIMENS EXAMINED:

PANAMA: Buena Vista Camp on Chiriquí Trail, Bocas del Toro, *Cooper* 226 (F, Y).

COLOMBIA: *Mutis* 5157 (Madrid).

The disjointed distribution of this species is not paralleled within the genus. The three specimens cited all differ somewhat, but none are in good condition for study.

86a. Besleria pauciflora var. **uniflora** Morton, var. nov.

A var. *typica* pedunculo communi nullo, pedicellis solitariis axillaribus, corollis flavis differt.

Differs from the typical variety in the pale yellow corolla and in lacking a common peduncle, the pedicels being solitary and axillary.

Type in the New York Botanical Garden, collected at Cana, Panama, April–June 1908, by R. S. Williams (no. 740).

87. Besleria peruviana Fritsch, Repert. Sp. Nov. Fedde **18**: 7. 1922.

Suffrutescent herb; stems hirsute; petiole up to 4 cm long, hirsute; leaf blades elliptic or lance-elliptic, up to 15 cm long and 6.5 cm broad, nearly entire, cuneate at base, hirsute on midrib and veins beneath; peduncle 4–6 cm long; pedicels 1.5–2 cm long; calyx about 15 mm long, the lobes lanceolate, acuminate, united to middle; corolla orange-red, 20–22 mm long, not much ventricose, the tube glabrous without, the two larger lobes pilose externally, sparingly glandular-pilose within throat; ovary glabrous; disk annular.

TYPE: La Merced, Dept. Junín, Peru, *Weberbauer* 1958 (B).

RANGE: Peru, at 700 to 800 meters elevation.

87a. Besleria peruviana var. **occulta** Morton, var. nov.

A var. *typica* corollis (lobis inclusis) omnino glabris differt.

Differs from the typical variety in its entirely glabrous corolla.

Type in the U. S. National Herbarium, no. 1,358,572, collected at La Merced, Department of Junín, Peru, altitude 700 meters, May 29–June 4, 1929, by E. P. Killip and A. C. Smith (no. 24086).

87b. Besleria peruviana var. **dissimilis** Morton, var. nov.

A var. *typica* pedunculis communibus nullis, pedicellis solitariis axillaribus, corollae tubo externe piloso differt.

Differs from the typical variety in lacking a common peduncle (the pedicels being solitary and axillary), and in having the corolla tube pilose externally.

Type in the Berlin Herbarium, collected on the lower Ucayali River, Department of Loreto, Peru, altitude 180 meters, Sept. 7, 1923, by G. Tessmann (no. 3170).

88. Besleria patrisii DC. Prodr. 7: 638. 1839.

Stems hirsute; petioles up to 3.4 cm long; leaf blades oblong-elliptic, up to 20 cm long and 8 cm wide, serrulate, cuneate at base, hirsute on midribs and veins

beneath; peduncle 1.2–1.3 cm long; pedicels 4, slender, about 2 cm long; calyx 12–14 mm long, the lobes lanceolate, acuminate, apparently united to middle; corolla 21 mm long, cylindric, not ventricose, not bilabiate, glabrous.

TYPE: French Guiana, *Patris* (photograph, F).

89. Besleria verecunda Morton, Phytologia 1: 152. 1935.

Stems strigose when young, soon glabrous; petiole up to 7 cm long; leaf blades elliptic or elliptic-oblong, up to 22 cm long and 10 cm wide, serrate, cuneate at base, strigose on the midribs and veins beneath, the primary veins 7–9 pairs; peduncle up to 4.5 cm long; pedicels 3 or 4, about 2 cm long; calyx 12–13 mm long, the lobes lanceolate, subulate-acuminate, united at base for 5 mm; corolla 20 mm long, glabrous without and within, scarcely ventricose, the limb regular; ovary glabrous; disk annular.

TYPE: Upper Demerara River, British Guiana, *Jenman* 5156 (W).

RANGE: British Guiana.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K, Y).

90. Besleria divaricata Poepp. Nov. Gen. & Sp. 3: 2. 1845.

Suffrutescent herb; young stems densely ferruginous-strigillose; petioles up to 10 cm long, slender; leaf blades elliptic, up to 15 cm long and 10 cm wide, membranous, subentire, rounded at base, sparingly strigillose on the veins beneath, the primary veins 9–11 pairs; peduncles up to 10 cm long; pedicels subcorymbose, up to 2.7 cm long; calyx about 15 mm long, the lobes lanceolate, acuminate, united to the middle; corolla crimson (or orange?), about 23–25 mm long, scarcely ventricose, glabrous without, glandular-pilose within throat; ovary glabrous; disk annular.

TYPE: Cochero, Peru, *Poeppig* (B).

RANGE: Peru and Ecuador.

ADDITIONAL SPECIMENS EXAMINED:

PERU: Pongo de Manseriche, Dept. Loreto, *Mexia* 6322 (B, F, W). Without locality, *Mathews* 2006 (K).

ECUADOR: Specific localities doubtful, *André* K1483 (K, Y), K1484 (K), 4617 (K, Y).

91. Besleria laxiflora Benth. in Lond. Journ. Bot. 5: 361. 1846.

Besleria chiapensis T. S. Brandeg. Univ. Calif. Publ. Bot. 6: 64. 1914.

Besleria debilis Rusby, Descr. New S. Amer. Pl. 123. 1920.

Besleria tenuifolia Rusby, loc. cit.

Shrub or suffrutescent herb; stems densely strigose when young; petioles up to 5 cm long; leaf blades elliptic or narrowly oblong, up to 21 cm long and 8.5 cm wide, usually smaller, serrulate, cuneate at base, sparsely strigillose on the midrib and veins beneath, primary veins 5–10 pairs; peduncles up to 4.5 cm long, commonly equaling or exceeding the umbellate or subcymose pedicels; calyx exceedingly variable, 7.5–14 mm long, orange or red, one third to one half the length of the corolla, the lobes ovate or lanceolate, subcoriaceous, nearly free, attenuate into a mucro; corolla red or orange, erect, not saccate at base, up to 22 mm long, slightly ventricose, glabrous without, bearing a hairy ring within at the insertion of the stamens, glandular within the throat; ovary glabrous; disk annular.

TYPE: British Guiana, *Schomburgk* 205 (K).

RANGE: Mexico to Colombia and Brazil, at altitudes up to 1,400 meters.

ADDITIONAL SPECIMENS EXAMINED:

MEXICO: Finca Mexiquito, State of Chiapas, *Purpus* 7003 (C, F, G, M, W, Y), type of *B. chiapensis*. Río Blanco, State of Chiapas, *Rovirosa* 870 (K, P).

BRITISH HONDURAS: Pueblo Viejo, *Schipp*, S–639.

GUATEMALA: Cubilquitz, Dept. Alta Verapaz, *Tuerckheim* 7644 (G, W, Y), 7756 (G, W), II. 162 (W). Panzos, Dept. Alta Verapaz, *Donnell Smith* 1700 (W). Chamá, Dept. Alta Verapaz, *Johnson* 397 (W). Finca Sepacuité, Dept. Alta Verapaz, *Cook & Griggs* 579 (W). Cerro de las Minas, Dept. Izabal, *Blake* 7806 (W). Without specific locality, *Watson* 473 (G).

HONDURAS: Lancetilla Valley, Atlántida, *Standley* 52648 (F), 52773 (F, W), 52941 (F, W), 53880 (F, W), 54132 (F, W), 54572 (F, W); *Bangham* 219 (G); *Chickering* 111 (F, Mi); *Yuncker* 4718 (F, Mi).

NICARAGUA: Braggman's Bluff, *Englesing* 154 (F), 284 (F). Chontales, *Tate* 314 (K); *Seemann* 61 (K).

COSTA RICA: Río del Destierro, Santa Clara, Prov. Limón, *Pittier* 7601 (G, W). Río Verde, Santa Clara, Prov. Limón, *Donnell Smith* 6717 (G, W). Tsaki, Prov. Limón, *Tonduz* 9559 (F, W). Tuis, Prov. Cartago, *Tonduz* 11511 p. p. (W). Cabagra, Prov. Puntarenas, *Tonduz* 6679 (W). La Colombina Farm, Prov. Limón, *Standley* 36916 (W). Quebrada Huaca, Prov. Puntarenas, *Dodge & Goerger* 10308 (F). El General, Prov. San José, *Skutch* 3007 (W).

PANAMA: Sibubi Falls, *W. W. & H. E. Rowlee* 375 (W, Y). Frijoles, *Killip* 3440 (W), 12146 (W); *Standley* 27562 (W). Chagres, *Fendler* 325 (K). Between Gorgona and Gatun, *Pittier* 2282 (G, W). Paca, *Williams* 731 (W, Y). Boca de Panarandó, *Pittier* 5587 (W). Río Gariche, *Seibert* 361 (W).

BRITISH GUIANA: Mataruki River, *Myers* 5839 (K).

BRAZIL: Rio Branco, State of Amazonas, *Ule* 8459 (B, K).

COLOMBIA: San Diego, Santa Marta, Dept. Magdalena, *H. H. Smith* 2672 (K, M, P, W, Y), type of *B. tenuifolia*. Below Valparaiso, Dept. Magdalena, *H. H. Smith* 1399 (G, K, M, P, W, Y), type of *B. debilis*.

The range of this species is one of the most extensive in the genus. Several years ago most of the Central American specimens in the various herbaria were annotated by me as *B. chiapensis*, but I have since decided that that species may not be kept distinct from *B. laxiflora*. There is a good deal of diversity among the various specimens as to the relative length of the calyx and corolla.

92. Besleria macropoda Donn. Smith, Bot. Gaz. **25**: 155. 1898.

Herb; young stems closely strigillose, the older glabrous; petioles 5–15 mm long; leaf blades oblong or elliptic, 10–14 cm long, 3.5–5 cm wide, cuneate at base, denticulate, glabrous, the primary veins about 11 pairs; peduncle 6–13 cm long, pedicels 5–9, about 2 cm long; calyx lobes subulate-lanceolate, 10–12 mm long, glabrous, free; corolla yellow, slightly ventricose, 15–18 mm long, glabrous without, with a hairy ring within at insertion of filaments, glandular-pilose within throat; ovary glabrous; disk annular.

TYPE: El Recreo, Costa Rica, *Pittier* 572.

RANGE: Costa Rica, at 200 to 650 meters elevation.

SPECIMENS EXAMINED: Santa Clara, Prov. Limón, *Pittier* 13381 (W). Tuis, Prov. Cartago, *Tonduz* 11358 (W). Carrillo, *Pittier* 2495 (W).

93. Besleria elongata Urban, Symb. Antill. **2**: 353. 1901.

Shrub; stems pilose when young; petioles 2–3 (or 5) cm long; leaf blades elliptic, up to 30 cm long and 10 cm wide, crenate or crenulate, broadly cuneate at base, pilosulous on the nerves beneath, the primary veins 12 or 13 pairs; peduncle up to 9 cm long; pedicels subcorymbose, about 10 mm long; calyx 10–14 mm long, the lobes free, narrowly ovate, long-acuminate; corolla yellow, 15–20 mm long, glabrous; ovary glabrous; disk annular.

TYPE: St. Vincent, *H. H. & G. W. Smith* 1275.

RANGE: St. Vincent.

SPECIMEN EXAMINED: Type collection (Y).

94. Besleria umbrosa Mart. Nov. Gen. & Sp. 3: 44. 1829.

Stems subsericeous toward apex; petioles up to 3.5 cm long, nearly glabrous; leaf blades elliptic-oblanceolate or elliptic, up to 20 cm long and 12.5 cm wide, cuneate at base, membranous, entire or slightly denticulate, glabrous above, the margins and veins puberulous beneath, the primary veins 7–11 pairs; common peduncles slender, up to 6 cm long, puberulous, the pedicels subcorymbose, slender, up to 3 cm long; calyx lobes lemon-yellow, ovate-lanceolate, about 12 mm long in anthesis, slightly unequal, acute, mucronate, entire, imbricate, entirely free, minutely glandular-puberulous externally, glabrous within; corolla white or yellow, about 2 cm long, erect, not spurred, the tube broad, glabrous; ovary glabrous; disk annular, glabrous.

Type: Mandiocca, State of Rio de Janeiro, Brazil, *Martius* (photograph, F).

Range: State of Rio de Janeiro, Brazil.

Additional specimens examined: Mandiocca, *Riedel* 115 (W). Petropolis, *Ball* (K, W, Y). Tijuca, *Glaziou* 3046 (Y). Rio de Janeiro, *Glaziou* 8818 (K), 14042 (Co, K). Without specific locality, *Talbot* in 1840 (K).

95. Besleria selloana Kl. & Hanst. in Mart. Fl. Bras. 8[1]:398. *pl. 65, fig. 2.* 1864.

Stems tomentulose toward apex; petioles thick, up to 9 cm long; leaf blades obliquely elliptic or elliptic-lanceolate, up to 28 cm long and 11 cm wide, cuneate at base, membranous, entire, minutely puberulous on the veins beneath, the primary veins 8–13 pairs; common peduncles thick, up to 5.5 cm long, puberulous, the pedicels numerous, subcorymbose, 1.5–3.5 cm long, thickened toward apex; calyx lobes oblong, 8.5–10.5 mm long, rounded at apex, not mucronate, free, little imbricate, venose, entire, thick-membranous, puberulous externally, glabrous within; corolla white, the base yellowish, 15–24 mm long, erect, not spurred or gibbous at base, the tube cylindric, 7–8 mm wide, not ventricose, almost glabrous externally, pilosulous within throat, the throat a little contracted, the limb terminal, narrow; androecium glabrous; ovary glabrous; style strigillose; disk annular, glabrous.

Type: Serra do Cubatão, Brazil, *Sello.*

Range: Southern Brazil.

Specimen examined: Alto de Serra, State of São Paulo, *Dusén* 14223 (G, S).

The above description is drawn from the Dusén specimens at hand, which agree fairly well with the original description.

96. Besleria grandifolia Schott in Schreibers, Nachr. K. Oestr. Naturf. Bras. Anh. 5. 1820.

Stems subappressed-pilosulous; petioles up to 4.5 cm long; leaf blades elliptic, up to 15 cm long and 6.5 cm wide, cuneate at base, membranous, entire, glabrous above, pilosulous beneath on veins and leaf surface, the primary veins about 9 pairs; common peduncle about 3 cm long, densely subappressed-pilosulous, the pedicels subcorymbose, up to 1.8 mm long; calyx lobes unequal, 7–8.5 mm long, united at base for about 3 mm, the free parts ovate or oblong, acute, a little mucronate, little imbricate, coriaceous, not venose, entire, glandular-pilosulous externally, glabrous within; corolla yellow, about 15 mm long, erect, not saccate at base, the tube about 5 mm wide, a little ventricose upwardly, sparsely glandular externally, lacking a hairy ring within, the throat a little contracted, the limb terminal, narrow, regular; ovary puberulous; stigma stomatomorphic; disk annular, thin, glabrous.

Type: "Epigaea in sylvis montium altiorum (Serra Grande)", Brazil, *Schott* (Serra de Tingua, teste Hanstein).

Range: State of Rio de Janeiro, Brazil.

Specimens examined: Type collection (F).

This species is obviously different from *B. selloana* in its thicker, mucronate, higher-connate calyx lobes, glandular-pilose externally, and in its denser, more

spreading pubescence. *Besleria umbrosa* differs in its free calyx lobes, with much shorter glandular hairs, its glabrous ovary, and closely appressed pubescence of stems and other parts.

97. Besleria rhytidophyllum Hanst. Linnaea **34**: 332. 1865.

Stems densely strigose-subtomentose when young; petioles up to 3 cm long; leaf blades elliptic or oblanceolate, up to 17.5 cm long and 5 cm wide, membranous, denticulate, cuneate at base, sparsely strigose on mesophyll and veins beneath, the primary veins 8–13 pairs; peduncles up to 7.5 cm long; pedicels subcorymbose, up to 1 cm long, glabrate or pilosulous; calyx up to 8 mm long, glabrous or sparsely pilose at base, orange or reddish, the lobes suborbicular, much imbricate, the margin scarious, rounded, not at all mucronate, without a midrib; corolla purplish- or brownish-orange, 12–15 mm long, not ventricose, glabrous without, glandular within throat, the limb broad (about 10 mm); ovary glabrous; disk annular; berry white.

TYPE: Colonia Tovar, Venezuela, *Moritz* 869 (B).

RANGE: Venezuela, at 1,800 to 2,000 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K). Type locality, *Fendler* 788 (G, K, P, Y); *Karsten* (B). Without specific locality, *Pittier* (F, W).

98. Besleria heterosepala Fritsch, Notizbl. Bot. Gart. Berlin **11**: 971. 1934.

Stems hirsute; petioles hirsute, about 2 cm long; leaf blades broadly elliptic, 16–21 cm long, 8–11 cm broad, subcoriaceous, entire, hirsute on the veins beneath; veins and veinlets elevated beneath, prominently reticulate, primary veins 9 or 10 pairs; peduncles sparingly hirsute, about 7 cm long; pedicels umbellate, numerous, about 10 mm long; calyx 10 mm long, the lobes nearly free, rounded, hirsute, entire, the margin erose and scarious, the posterior lobe much larger and thicker; corolla orange, 12–15 mm long, glabrous; ovary and style densely pubescent; disk semiannular.

TYPE: Río Frio, Colombia, *Kalbreyer* 1959 (B).

RANGE: Colombia, at 2,100 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Type collection (K).

99. Besleria subcarnosa Fritsch, Notizbl. Bot. Gart. Berlin **11**: 972. 1934.

Stems suffruticose, 2.4–3.6 m high, villous; petioles 4–7 mm long, villous; leaf blades broadly elliptic, 6–13 cm long, 3–7 cm wide, subcordate at base, thick and somewhat fleshy, minutely denticulate, glabrous and shining above, hirsute on the strongly reticulate veins beneath, the primary veins 7–9 pairs; common peduncle 3–7.5 cm long, sparingly hirsute, the pedicels subumbellate, numerous, 4–6 mm long, hirsute; calyx lobes elliptic-oblong, 5–6 mm long, free, obtuse, strongly imbricate, entire, venose, hirsute externally, glabrous within; corolla orange with yellow, about 10 mm long, erect, not spurred or saccate at base, the tube glabrous externally, with a conspicuous hairy ring within at insertion of filaments, about 4 mm wide, the throat contracted, about 3.5 mm wide, the limb terminal, narrow, regular; ovary densely pubescent; style pubescent; disk reduced to a posterior, fleshy, glabrous gland.

TYPE: La Obrel, Dept. Santander, Colombia, *Kalbreyer* 882 (B).

RANGE: Eastern Cordillera of Colombia, at 2,400 to 2,700 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K). Prov. Ocaña, Dept. Norte de Santander, *Schlim* 340 (K). ?Batatal, Dept. Santander, *Kalbreyer* 897 (K).

The last specimen cited may represent a recognizable variety. Its characters are not included in the above description.

Fritsch in his original description placed this species in the section *Gasteranthus*, but the corolla is entirely at variance with the species of that group. The rela-

tionship to *B. heterosepala* of the section *Eubesleria* is very close indeed, both in appearance and technical characters. The two species differ chiefly in the shape of the calyx lobes.

100. Besleria longipedunculata Britt. Bull. Torrey Club **27**: 69. 1900.

Besleria aurantiaca Fritsch, Med. Rijks. Herb. Leiden **29**: 51. 1916.

Young stems strigose, soon glabrous; petioles up to 4 cm long; leaf blades elliptic, up to 32 cm long and 13 cm broad, membranous, remotely denticulate, broadly cuneate at base, strigose on the midrib and veins beneath, the primary veins 7–11 pairs; peduncles up to 20 cm long; pedicels stout, up to 4 cm long; calyx 12–15 mm long, coriaceous, the lobes strongly mucronate, united to middle; corolla red, the tube about 20 mm long, fleshy, glabrous, the throat glandular-pilose within, the limb slightly bilabiate, 15–16 mm wide, the lobes broadly spreading; ovary glabrous; disk annular.

TYPE: Mapiri, Bolivia, *Rusby* 2436 (Y).

RANGE: Bolivia, at 850 to 1,500 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (P, W). Hacienda Simaco, *Buchtien* 5556 (W, Y), 5557 (W). San Carlos, *Buchtien* 1341 (G, S, W). Hacienda Casana, *Buchtien* 7482 (B, W). Without special locality, *Bang* 2539 (W, Y).

101. Besleria lutea L. Sp. Pl. 619. 1753.

Eriphia jamaicensis Roem. & Schult. Syst. Veg. **3**: 337. 1818.
Eriphia lutea Raf. Sylv. Tellur. 77. 1836.
Eriphia pallida Raf. loc. cit.
Besleria berteriana DC. Prodr. **7**: 538. 1839.
Besleria imrayi Hook. in Bot. Mag. Curtis **104**: *pl. 6341*. 1878.
Besleria lutea var. *vulgaris* Urban, Symb. Antill. **2**: 347. 1901.
Besleria lutea var. *alpestris* Urban, op. cit. 348.
Besleria lutea var. *brevipes* Urban, loc. cit.
Besleria lutea var. *intermedia* Urban, loc. cit.
Besleria lutea var. *imrayi* Urban, loc. cit.
Besleria lutea var. *vincentina* Urban, loc. cit.
Besleria lutea var. *leucantha* Urban, op. cit. **8**: 644. 1920.

Shrub or tree, 1–7 m high, erect or rarely scandent; stems glabrous and shining at maturity; leaf blades ovate or elliptic-oblong, up to 20 cm long and 9 cm wide, cuneate or rounded at base, short-petiolate or subsessile, serrate, glabrate above, strigillose beneath at least on the veins, the primary veins about 9 pairs; common peduncle very short or usually obsolete, the pedicels few, 3–20 mm long; calyx lobes connate for two thirds their length or more, about 10 mm long, glabrate, mucronate; corolla yellow or rarely white, 15–20 mm long, erect, not saccate at base, a little ventricose, contracted in throat, the limb terminal, small, the lobes subequal, 2–3 mm long; androecium glabrous; ovary and style glabrous; disk annular, glabrous; berry red, enclosed within calyx.

TYPE: West Indies.

RANGE: Cuba, Haiti, Jamaica, and Lesser Antilles.

This species is so common and well known that it has not seemed worth while to cite the numerous specimens examined. The various varieties described by Urban are local in distribution. Most distinct is var. *imrayi*, of Dominica and Martinique, by reason of its subsessile leaves. The white rather than yellow flowers distinguish var. *leucantha* of Hispaniola (and Jamaica?). Typically, *B. lutea* is a low shrub, but var. *vincentina*, of St. Vincent, is arborescent. The pedicels are normally 1 to 2 cm long, but var. *brevipes*, from St. Lucia, is said to have pedicels only 3 to 10 mm long. The leaf surface is glabrous or nearly so in var. *vulgaris*, minutely strigillose in varieties *alpestris* and *intermedia*, from Guadeloupe, Martinique, Dominica, St. Kitts, and Montserrat. Further collections are necessary to decide on the validity of these forms.

102. Besleria insolita Morton, Phytologia **1**: 153. 1935.

Stems terete, hirto-strigose; petioles strigillose, up to 7 cm long; leaf blades elliptic or elliptic-oblong, up to 25 cm long and 10 cm wide, cuneate at base, serrate, strigillose beneath, primary veins 8–12 pairs; pedicels numerous, 12–15 mm long, hirto-puberulous; calyx yellow, cylindric, 7–16 mm long, hirto-puberulous, the lobes united two thirds their length; corolla ochroleucous, little longer than calyx, glabrous, scarcely ventricose; ovary glabrous; disk annular, thin.

TYPE: French Guiana, *Martin* (K).

RANGE: British and French Guiana.

ADDITIONAL SPECIMENS EXAMINED:

FRENCH GUIANA: Without locality, *Poiteau* (K).

BRITISH GUIANA: Holmia, Potaro River, *Bartlett* 8743 (Y).

103. Besleria floribunda Fritsch, Repert. Sp. Nov. Fedde **18**: 10. 1922.

Stems densely and persistently sericeous-tomentose; petioles sericeous, up to 1.8 cm long; leaf blades lanceolate, up to 11 cm long and 2.7 cm wide, cuneate at base, membranous, entire, densely pilosulous above, sericeous-pilosulous beneath, the primary veins 8 or 9 pairs; peduncles erect, up to 4.5 cm long, densely sericeous-pilose, the pedicels 2–4, slender, 1.2–2 cm long, densely pubescent; calyx lobes free, ovate, about 4 mm long, obtuse, membranous, entire, pilosulous in a median line, puberulous within; corolla light yellow, 22–27 mm long, strongly oblique, spurred, the spur rounded, about 2.5 mm long, the tube evenly ampliate upwardly, not ventricose, bearing a few scattered hairs externally, entirely glabrous within, not contracted at throat, the throat about 7 mm broad, the limb terminal, about 11 mm wide, the lobes subequal; androecium glabrous; ovary and style pilosulous; disk regular, annular, glabrous.

TYPE: Ocaña to Pamplona, Dept. Norte de Santander, Colombia, *Kalbreyer* 1062 (B).

RANGE: Colombia, at 1,500 to 1,800 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (K). Soto, *Schlim* 1090 (B).

104. Besleria penduliflora Fritsch, Repert. Sp. Nov. Fedde **18**: 9. 1922.

Stems densely and persistently sericeous; petioles 1.5–2.5 cm long, densely sericeous; leaf blades narrowly elliptic, up to 14 cm long and 4.7 cm wide, cuneate at base, membranous, saliently denticulate, persistently and densely pilosulous on both surfaces, the primary veins 8 pairs; common peduncles very slender, 5–7 cm long, pendent, densely appressed-pilosulous, the pedicels one or two, slender, about 3 cm long in flower, 4.5 cm long in fruit; calyx lobes free, lanceolate, about 7 mm long, membranous, acuminate, entire, not venose, pilosulous externally, puberulous within, unequal, the posterior longer and narrower, deflexed; corolla light yellow, 35–40 mm long, strongly oblique in calyx, spurred at base, the spur rounded, about 3 mm long, the tube gradually ampliate upwardly but not at all ventricose, very sparingly pilosulous externally and within throat, the throat not contracted, about 1 cm wide, the limb about 15 mm broad, the lobes a little unequal; androecium glabrous; ovary and style pilosulous; disk annular, regular, glabrous.

TYPE: Roraima, Venezuela, *Ule* 8751 (B).

RANGE: Venezuela, at 1,600 meters elevation.

105. Besleria pendula Hanst. Linnaea **34**: 333. 1865.

Stems densely brown-strigose; petioles up to 3.5 cm long, brown-strigose; leaf blades lanceolate, up to 11 cm long and 3 cm wide, membranous, cuneate at base, minutely denticulate or subentire, sparsely strigose above, sparsely strigose beneath, especially on the veins, the primary veins 4 or 5 pairs; common peduncles

very slender, up to 10 cm long, strigose, pendent, the pedicels few to many, very slender, in anthesis about 2 cm long, strigose; calyx lobes ovate, 3–3.5 mm long, obtuse, membranous, entire, sparingly pilose at base only; corolla 17–24 mm long, strongly oblique, spurred at base, the spur rounded, 2–3 mm long, the tube evenly ampliate upwardly, glabrous externally, puberulous within throat, the throat not contracted, about 8 mm wide, the limb small, nearly regular; stamens exserted; anthers connate; ovary and style pilosulous; disk annular, regular, glabrous.

TYPE: Mérida, Venezuela, *Moritz* 1135 (B).

RANGE: Venezuela.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, K). Caracas, *Linden* 299 (K). Lagunetas, between Trujillo and San Lázaro, *Jahn* 101 (W).

106. Besleria corallina Fritsch, Repert. Sp. Nov. Fedde **18**: 13. 1922.

Stems densely tomentose; petioles up to 13 mm long, tomentose; leaf blades elliptic-oblong, up to 25 cm long and 9 cm wide, membranous, cuneate at base, dentate-serrate, tomentulose beneath on the veins, the primary veins 9–11 pairs; common peduncle elongate, 8–17 cm long, tomentose, the pedicels numerous, subcorymbose, up to 15 mm long, pilosulous; calyx lobes broad, about 7 mm long, unequal, pilose on both sides, incised-serrate, the posterior reflexed; corolla scarlet, 15–17 mm long, spurred at base, the spur rounded, 2 mm long, the tube ventricose upwardly, densely pubescent externally, glabrous within, contracted at throat, the limb terminal, regular; androecium glabrous; ovary and style glabrous; stigma bilobed; disk semi-annular, pubescent.

TYPE: Cerro de Ponasa, Dept. Loreto, Peru, *Ule* 6671 (B).

RANGE: Loreto, Peru, at 100 to 1,200 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Río Santiago, above Pongo de Manseriche, Dept. Loreto, *Tessmann* 3720 (B); *Mexia* 6226 (F, W, Y). Río Marañon, *Spruce* 40 (K).

107. Besleria corallinoides Fritsch, Repert. Sp. Nov. Fedde **18**: 11. 1922.

Stem lanate-tomentose; petioles long-villous, up to 3 cm long; leaf blades elliptic-oblong, nearly 30 cm long and 10 cm wide, dentate-serrate, acute, long-attenuate at base, tomentulose beneath especially on the veins; peduncles tomentulose; pedicels numerous, subcorymbose, less than 10 mm long, pilosulous; calyx about 10 mm long, the lobes broad, acutish, conspicuously puberulous on both sides, dentate, green; corolla about 20 mm long, externally puberulous, subcalcarate at base, moderately ventricose upwardly, glabrous within, the limb terminal, small; filaments sparsely pubescent; anthers hairy; ovary glabrous or nearly so; disk thin, annular, much enlarged posteriorly, glabrous.

TYPE: Río Pilatón, Ecuador, *Sodiro* 119/55 (B).

RANGE: Ecuador, at 400 to 800 meters elevation.

ADDITIONAL SPECIMEN EXAMINED: Zatzayacu, Prov. Napo-Pastaza, *Mexia* 7082 (W).

The original description contains several inaccuracies, which are corrected in the above description. In general aspect the species strongly suggests *Besleria sylvarum*, which is undoubtedly its closest relative.

108. Besleria sylvarum Morton, sp. nov.

Caules et petioli densissime tomentosi; lamina foliorum oblanceolata vel oblonga, acuta vel acuminata, basi in petiolum decurrens, membranacea, grosse serrata, supra glabra, subtus imprimis in venis appresso-pubescens; pedunculus communis elongatus tomentosus, pedicellis numerosis umbellatis subtomentosis; calycis lobi ovati acutiusculi imbricati subaequales, paullo denticulati, utrinque parce puberuli; corolla in calyce horizontalis, basi calcarata, late ventricosa, externe molliter pubescens, limbo terminali; ovarium glabrum; discus in glandulam posticam puberulam vix bilobam reductus.

Herb up to 25 cm high, the stems fleshy, about 4 mm in diameter, densely tomentose; petioles up to 2 cm long, subtomentose; leaf blades oblanceolate to oblong, up to 15 cm long and 7 cm wide, acute or short-acuminate, narrowed and decurrent at base, membranous, coarsely serrate except at base, green and glabrous above, paler beneath, appressed-pubescent, especially on the veins, the primary veins 9 or 10 pairs; common peduncle up to 7 cm long, tomentose, the pedicels numerous, subumbellate, 7 mm long or less, subtomentose, thick, dilated at apex; calyx lobes ovate, about 5.5 mm long and 4 mm wide, imbricate, subequal, connate at base for 1 mm, acutish, a little denticulate, green, sparsely puberulous on both sides; corolla 12–15 mm long, horizontal in calyx, spurred posteriorly at base (the spur rounded, 2 mm long), the tube strongly ventricose, becoming 9 mm wide, soft-pubescent externally, glabrous within, the throat contracted, about 3.5 mm wide, the limb terminal, 5 mm wide, the lobes suberect, equal, transversely oblong, about 1 mm long and 2.5 mm wide, glabrous on both sides, not ciliate; filaments inserted about 4 mm above base of corolla, free, glabrous, not contorted; anthers connate; ovary and style glabrous; stigma bilobed; disk reduced to a puberulous, scarcely bilobed, posterior gland.

Type in the herbarium of the Naturhistoriska Rijksmuseet, Stockholm, collected in virgin forest at La Costa, District of El Tambo, Department of El Cauca, Colombia, altitude 1,000 meters, Aug. 2, 1936, by Kjell von Sneidern (no. 957).

RANGE: Colombia.

ADDITIONAL SPECIMENS EXAMINED: Same locality, *Sneidern* 481 (S), 956 (S), 970 (S).

109. Besleria crenata Morton, sp. nov.

Caules et petioli hirsuti; lamina foliorum elliptica, acuta, basi cuneata, grosse crenata, supra glabrata, subtus hirsuta; pedunculus communis crassus elongatus pilosus, pedicellis umbellatis crassis; calycis lobi inaequales, anteriores ovati acuti, laterales latiores, posticus suborbicularis rotundatus, omnes virides, fere liberi, evidenter dentati, utrinque pilosi; corolla coccinea, basi lutea, in calyce horizontalis, basi calcarata, sursum ventricosa, limbo terminali; ovarium glabrum; discus annularis, postice crassior, puberulus.

Stems fleshy, fistulose (?), densely hirsute upwardly, glabrescent below; petioles short, 1–1.5 cm long, hirsute; leaf blades elliptic, up to 15 cm long and 6 cm wide, acute, cuneate at base, coarsely crenate, glabrate above, hirsute beneath, especially on the veins, the primary veins about 9 pairs; common peduncle thick, up to 8 cm long, pilose, the pedicels umbellate, about 5 mm long, thick, pilose; calyx lobes green, spreading, nearly free, obviously dentate, pilose on both sides, ciliolate, unequal, the anterior ovate, about 7 mm long, acute, the lateral broader, about 9 mm long, the posterior one suborbicular, rounded, about 11 mm long; corolla scarlet, yellow at base, about 17 mm long, horizontal in calyx, fleshy, spurred at base (about 3 mm), ventricose upwardly, becoming 7 mm wide, densely pubescent externally, the throat contracted, about 4 mm wide, the limb terminal, the lobes erect, rounded, glabrous, about 2.5 mm long; anthers connate, the cells confluent; ovary conic, glabrous; disk annular, thicker posteriorly, puberulous.

Type in the Kew Herbarium, collected at San Pablo, Department of Nariño, Colombia, May 1876, by E. André (no. 3329).

RANGE: Department of Nariño, Colombia.

ADDITIONAL SPECIMEN EXAMINED: Armada (?), Department of Nariño, *André* K 1486 (K).

110. Besleria panamensis Morton, sp. nov.

Caules et petioli glabri; lamina foliorum ovalis obtusa, basi late et oblique cuneata, denticulata, supra parce strigosa, subtus praecipue in venis strigillosa; pedunculus communis elongatus puberulus, pedicellis umbellatis brevibus glabris;

calycis lobi liberi ovales imbricati inaequales venosi integri, externe glabri, intus plus minusve glandulosi; corolla magna, in calyce horizontalis, basi calcarata, tubo glabro, sursum ventricoso, in fauce contracto, limbo terminali; ovarium glabrum; discus postice crassior, villosus.

Stems fleshy, glabrous, about 1 cm in diameter; petioles thick, about 4 cm long; leaf blades oval, very large, up to 25 cm long and 16.5 cm wide, obtuse, broadly and obliquely cuneate at base, denticulate, green above, sparsely strigose, paler beneath, strigillose, especially on the veins, the primary veins about 14 pairs; common peduncle elongate, 13–14 cm long, puberulous, the pedicels numerous, umbellate, up to 15 mm long, glabrous; calyx lobes unequal, the four larger oval, obtuse, about 14 mm long, the posterior one concave, 11 mm long and 16 mm wide, all free, oblique, imbricate, membranous, veiny, entire, glabrous externally, sparingly or densely glandular within; corolla about 30 mm long, horizontal in calyx, long-spurred at base (8 mm), the tube glabrous, 7 mm wide near base, ventricose upwardly, becoming 14 mm wide, the throat contracted, 11 mm wide, the limb terminal, the lobes small and broad; filaments about 11 mm long; ovary glabrous; disk thickened posteriorly, villous.

Type in the U. S. National Herbarium, no. 1,081,657, collected in the Province of Bocas del Toro, Panama, Apr. 22, 1921, by M. A. Carleton (no. 205).

111. Besleria imbricans Donn. Smith, Bot. Gaz. **25**: 155. 1898.

Stems minutely puberulous, soon glabrous; petioles up to 4 cm long; leaf blades elliptic, up to 23 cm long and 11 cm wide, cuneate and oblique at base, membranous, entire, strigillose on the veins beneath, the primary veins 16 or 17 pairs; common peduncle glabrous, about 8.5 cm long, the pedicels short, few; calyx lobes orange, suborbicular, about 7 mm long, imbricate, membranous, glabrous, entire, not ciliate, unequal; corolla scarlet, horizontal, 15 mm long, spurred, the spur 1.5 mm long, the tube fleshy, glabrous, ventricose upwardly, the throat contracted, the limb small, terminal; androecium glabrous; ovary glabrous; disk pubescent, enlarged posteriorly.

TYPE: Shirores, Talamanca, Prov. Limón, Costa Rica, *Tonduz* 9192 (W).

RANGE: Costa Rica, at 100 meters elevation.

111a. Besleria imbricans var. uncinata Morton, Field Mus. Publ. Bot. **18**: 1152. 1938.

Differs from the typical variety in its smaller, serrate leaves, and longer, slightly hooked spur.

TYPE: Las Vueltas, Tucurrique, Prov. Cartago, Costa Rica, altitude 900–1,000 meters, *A. Tonduz* (Herb. Nat. Cost. 13038) (W).

112. Besleria wendlandiana Hanst. Linnaea **34**: 318. 1865.

Stems densely lanate-tomentulose; petioles tomentulose, up to 2 cm long; leaf blades elliptic, up to 20 cm long and 9 cm wide, cuneate at base, serrate, lanate-puberulous on the veins beneath, the primary veins about 13 pairs; common peduncle elongate, up to 9 cm long, the pedicels numerous, about 1 cm long; calyx green, the lobes ovate-lanceolate, 8–12 mm long in anthesis, up to 16 mm long in fruit, callose-serrulate, sparsely pilosulous; corolla yellow, 18–23 mm long, horizontal, spurred at base, the tube cylindric, not ventricose, externally pilosulous, the limb terminal, 10 mm wide; ovary sericeous; disk villosulous, thicker posteriorly.

TYPE: Turrialba, Prov. Cartago, Costa Rica, *Wendland* 922 (B).

RANGE: Costa Rica and Panama, at 900 to 2,400 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COSTA RICA: Yerba Buena, Prov. Heredia, *Standley & Valerio* 49757 (W), 49788 (W), 49806 (W), 49813 (W), 50054 (W). El Muñeco, Prov. Cartago, *Standley & Torres* 50989 (W). La Hondura, Prov. San José, *Standley & Valerio*

51798 (W). Pejivalle, Prov. Cartago, *Standley & Valerio* 46867 (W). Cerros de Zurqui, Prov. Heredia, *Standley & Valerio* 50289 (W). Cerro de las Caricias, Prov. Heredia, *Standley & Valerio* 52016 (W). La Palma, Prov. San José, *Pittier*, Herb. Nat. C. R. 690 (W). La Palma de San Ramón, Prov. Alajuela, *Brenes* 5740 (F), 13575 (F), 19007 (F).

PANAMA: Bajo Chorro, Prov. Chiriqui, *Davidson* 381 (F).

113. Besleria columbiana Morton, sp. nov.

Caules et petioli inconspicue strigillosi; lamina foliorum elliptica acuminata, basi cuneata, parum denticulata, membranacea, supra glabra, subtus imprimis in venis strigillosa; pedunculus communis elongatus gracilis glaber, pedicellis brevioribus glabris; calycis lobi liberi acuminati serrati, utrinque glandulosopubescentes; corolla flava calcarata, in calyce horizontalis, externe sparse pilosa, fauce aperta, limbo terminali; ovarium villosum; discus ad glandulam magnam posticam villosam reductus.

Shrub up to 1 m high, sparingly branched, the stems slender, obscurely quadrangular, about 3.5 mm in diameter, inconspicuously strigillose upwardly, glabrous and shining below; petioles up to 3 cm long, strigillose; leaf blades elliptic, up to 13 cm long and 5 cm wide, acuminate, cuneate at base, inconspicuously denticulate, glabrous above, strigillose beneath, especially on the veins, the primary veins about 8 pairs; common peduncle about 6.5 cm long, slender, glabrous, the pedicels up to 10 mm long, slender, nearly glabrous; calyx lobes free, 6–7 mm long, acuminate, serrate, glandular-pubescent on both sides; corolla pale yellow, 16–20 mm long, horizontal in calyx, spurred at base (3.5 mm), the tube gradually enlarged upwardly, sparsely pilose externally, the throat open, about 7 mm wide, the limb terminal, the lobes 2–3 mm long, rounded, spreading, glabrous; anthers connate; ovary villous; style pubescent; disk reduced to a large, villous, posterior gland.

Type in the Kew Herbarium, collected above Pipulquer, on the western slopes of the West Andes of Tuquerres, Department of Nariño, Colombia, in dense, wet forests, altitude 1,500–1,700 meters, by F. C. Lehmann (no. 5157).

113a. Besleria columbiana var. **arguta** Morton, var. nov.

A var. *typica* foliis serratis, corollis longe calcaratis, calcare ca. 6 mm longo differt.

Differs from the typical variety in its serrate leaves and long-spurred corolla (the spur 6 mm long).

Type in the Kew Herbarium, collected at San José, Department of Antioquia, Colombia, altitude 2,100–2,400 meters, Mar. 23, 1880, by W. Kalbreyer (no. 1509). Duplicate in the Berlin Herbarium.

This specimen was identified and reported by Fritsch as *B. calceolus* Fritsch, which bears a habital resemblance but differs strongly in characters of calyx and corolla.

114. Besleria rupestris Morton, Proc. Biol. Soc. Washington **48**: 57. 1935.

Scandent shrub, 0.6–1.5 m high; stems densely lanate-tomentose when young, 4–5 mm thick; petiole 1–1.5 cm long, lanate-tomentose; leaf blades oblong-lanceolate, up to 21 cm long and 7.5 cm wide, membranous, cuneate at base, crenate-serrate, puberulous above, soon glabrate, puberulous beneath, especially on the veins, the primary veins 9–15 pairs; common peduncle 6–7.5 cm long, puberulous, the pedicels subumbellate, few or many, about 6 mm long, glabrous; calyx lobes free, unequal, the anterior ovate-lanceolate, 8 mm long, the lateral ovate, 7 mm long, the posterior lanceolate, deflexed, 6.5 mm long, all membranous, acuminate, sharply serrate, sparsely pilose externally, glabrous within; corolla yellow, with conspicuous maroon spots on the tube and lobes, 22–32 mm long, horizontal in calyx, spurred at base, the spur rounded, 2–3 mm long, the

tube gradually enlarged (becoming 6–8 mm wide) but not ventricose, externally sparsely pilose, glabrous within, the throat not contracted, the limb terminal, a little bilabiate, 10–16 mm wide; androecium glabrous; ovary villous; style pubescent; stigma bilobed; disk reduced to a thick, puberulous, posterior gland.

TYPE: Valley of Pastaza River, Prov. Tungurahua, Ecuador, *Hitchcock* 21820 (W).

RANGE: Colombia, Ecuador, and Peru, at 1,300 to 1,900 meters elevation.

ADDITIONAL SPECIMENS EXAMINED:

COLOMBIA: La Costa, Dept. El Cauca, *Sneidern* 910 (S).

PERU: Eneñas, Dept. Junín, *Killip & Smith* 25759 (W). Puente Durand to Exito, Dept. Huánuco, *Mexía* 8237 (W).

The original material on which this species was based was inadequate and did not allow a proper diagnosis of the corolla. The von Sneidern and Mexía specimens cited are superior in every respect.

115. Besleria acropoda Donn. Smith, Bot. Gaz. **54**: 240. 1912.

Shrub with terete sparsely strigillose stems; petioles strigillose, 1–2 cm long; leaf blades elliptic, the larger 11 cm long and 5.5 cm wide, abruptly acuminate at apex, attenuate and decurrent at base, membranous, deeply serrate, glabrous above, strigillose on the veins beneath, the primary veins about 8 pairs; common peduncles axillary but subterminal by reduction of the main axis, 1.8–2.3 cm long, glabrous, the pedicels umbellate, few, about 1 cm long, glabrous; calyx lobes ovate-lanceolate, unequal (the larger 14 mm long), free, entire, membranous, oblique, sparsely pilosulous on both sides; corolla yellow, 23–30 mm long, horizontal, strongly spurred (the spur 3 mm long or more), the tube ampliate upwardly, a little ventricose, sparsely pilosulous externally, the limb bilabiate, 15 mm wide, the lobes spotted with purple; ovary glabrous; disk enlarged posteriorly, pubescent.

TYPE: Tsaki, Talamanca, Prov. Limón, Costa Rica, *Tonduz* 9554 (W).

RANGE: Costa Rica, at 200 meters elevation.

116. Besleria gibbosa (Poepp.) Hanst. in Mart. Fl. Bras. **8** [1]: 421. 1864.

Hypocyrta gibbosa Poepp. Nov. Gen. & Sp. **3**: 3. *pl. 202.* 1845.

Herb with quadrangular strigose stems; petioles 1.5–5 cm long, strigose; leaf blades broadly elliptic, up to 20 cm long and 10 cm wide, attenuate at base, thin-membranous, denticulate, thinly strigose on both sides, the primary veins about 9 pairs; common peduncle obsolete, the pedicels few or many, crowded, not over 8 mm long; calyx lobes ovate-oblong, 4.5 mm long, free, not imbricate, acute, entire, bearing a few long hairs externally, glabrous within; corolla white, 24–30 mm long, horizontal, spurred at base (the spur acute), the tube 4–7 mm broad at middle, sparingly pilosulous externally, glabrous within, the throat a little ampliate, 6–8 mm wide, the limb terminal, the lobes subequal; filaments slightly puberulous; ovary and style glabrous; disk reduced to a glabrous, fleshy, posterior gland.

TYPE: Ega, Brazil, *Poeppig* (photograph, W).

RANGE: Amazonian Brazil.

SPECIMEN EXAMINED: Paranagua, Rio Juruá, State of Amazonas, *Krukoff* 4554 (Y).

117. Besleria flava Morton, sp. nov.

Caules et petioli strigosi; lamina foliorum elliptica, acuminata, basi cuneata, minute denticulata, utrinque parce strigosa; pedicelli numerosi pilosi; calycis lobi oblongi obtusi membranacei, utrinque puberuli; corolla flava horizontalis, breviter calcarata, perspicue ventricosa, externe glabra, intus in fauce glandulosa; ovarium glabrum; discus semiannularis, plus minus in glandulas duas divisus.

Herb 30–60 cm high, the stems terete, strigose; petioles 15 mm long, strigose; leaf blades elliptic, up to 9 cm long and 4 cm wide, acuminate, obliquely cuneate

at base, minutely denticulate, green and sparsely strigose above, paler beneath, strigose especially on the veins, the primary veins about 9 pairs; common peduncle obsolete, the pedicels numerous, up to 9 mm long, pilose; calyx lobes oblong, 5 mm long, obtuse, membranous, scarious-marginate, puberulous on both sides, ciliolate; corolla yellow, about 16 mm long, short-spurred (1–1.5 mm), horizontal in calyx, glabrous externally, the tube conspicuously ventricose, 5 mm wide, the throat contracted, 4 mm wide, sparsely glandular within, the limb terminal, the lobes small, 1.5 mm long, obtuse; androecium glabrous, the filaments long, about equaling the corolla; ovary glabrous; disk glabrous, semiannular, more or less divided into two glands.

Type in the U. S. National Herbarium, no. 1,081,355, collected in forest at Quebradas Secas, Department of Alta Verapaz, Guatemala, altitude 850 meters, June 1, 1920, by Harry Johnson (no. 283).

RANGE: Guatemala, at low elevations.

ADDITIONAL SPECIMENS EXAMINED: Finca Sepacuité, *Cook & Griggs* 556 (W). Between Sepacuité and Secanquím, *Pittier* 318 (W).

118. Besleria herbacea Morton, sp. nov.

Caules crassi, apicem versus perspicue hirsuti; petioli hirsutuli, demum glabrescentes; lamina foliorum elliptica acuta, basi cuneata, membranacea, serrata, supra strigosa, subtus imprimis in venis hirsuta; pedunculus communis nullus, pedicello solitario axillari hirsuto; calycis lobi inaequales, anteriores ovato-lanceolati horizontales, laterales ovato-lanceolati erecti, posticus minor lanceolatus reflexus, omnes liberi imbricati integri, externe pilosi, intus glabri; corolla magna, in calyce horizontalis, basi postice calcarata, tubo piloso, supra basin contracto, tum abrupte dilatato et deflexo, in fauce non contracto, limbo terminali amplissimo bilabiato; ovarium pilosum; discus in glandulam posticam bilobam parce pilosulam reductus.

Herb about 30 cm high, the stems fleshy, 4–5 mm in diameter, conspicuously hirsute towards apex; petioles up to 4.5 cm long, hirsutulous, at length glabrescent; leaf blades elliptic, up to 12.5 cm long and 6.3 cm wide, acute, cuneate at base, membranous, serrate except at base, green above, strigose (the hairs long, hyaline, flaccid, many-celled), paler beneath, hirsute, especially on the veins, the primary veins about 6 pairs; common peduncle none; pedicel solitary, axillary, up to 4.5 cm long, hirsute; calyx lobes unequal, the anterior horizontal, ovate-lanceolate, about 16.5 mm long and 6.5 mm wide, the lateral ovate-lanceolate, erect, about 16 mm long and 6 mm wide, the posterior one lanceolate, about 11.5 mm long and 4.5 mm wide, all imbricate at base, free, entire, pilose externally, glabrous within; corolla 35 mm long, horizontal in calyx, spurred posteriorly at base (the spur rounded, about 5 mm long), the tube pilose externally, about 11 mm wide near base, upwardly contracted and about 6 mm wide, then very abruptly dilated and deflexed, the throat not contracted, 25 mm wide, pilosulous within, the limb terminal, very wide (at least 35 mm), bilabiate, the lobes rounded, the lower 15 mm long and at least 13 mm wide, the lateral a little smaller, the upper smaller than the lateral; filaments free, glabrous, inserted about 12 mm above base of the corolla (i. e. in the contracted part); staminodium glabrous, linear-subulate, 6.5 mm long, inserted at the base of the spur; anthers connate, the cells confluent; ovary pilose; style pilose, about 29 mm long; stigma bilobed; disk reduced to a posterior, bilobed, pilosulous gland, about 1.5 mm high and 3.5 mm wide; lamellae of the placentae ovuliferous only on the inner surface.

Type in the herbarium of the Naturhistoriska Rijksmuseet, Stockholm, collected at La Costa, District of El Tambo, Department of El Cauca, Colombia, altitude 800 meters, in virgin forest, July 3, 1936, by Kjell von Sneidern (no. 762). An additional specimen was collected by Sneidern at the same locality (no. 793).

119. Besleria salicifolia Fritsch, Oesterr. Bot. Zeitschr. 62: 407. 1912.

Herb with scandent, unbranched subterete stems, subappressed-pubescent toward apex; petioles slender, 1–2 cm long, strigillose; leaf blades linear-lanceolate, 4–8 cm long, 7–15 mm wide, attenuate at both ends, membranous, entire, conspicuously discolorous, glabrous above, strigose on the veins beneath, the primary veins 3–5 pairs; common peduncle obsolete, the pedicels solitary or paired, axillary, 3–4 mm long, strigose; calyx lobes linear-lanceolate, about 11 mm long, free, membranous, acuminate, entire, sparsely strigillose externally, glabrous within; corolla white or orange, erect or a little oblique, not spurred, the tube about 12 mm long, deflexed and narrowed above base, slightly ampliate upwardly, sparsely pilosulous externally, with a hairy ring within at insertion of stamens, glandular-pilose upwardly within, constricted in throat, the limb terminal, large, spreading, more than 16 mm wide, the lobes unequal, the two posterior about 6 mm long, the others 8 mm long; filaments pilose at base; ovary pilose; style puberulous; disk reduced to a thick, bilobed, glabrous, posterior gland.

Type: Pamplona, Dept. Santander, Colombia, *Schlim* 1675.

Range: Eastern Cordillera of Colombia, at 1,200 to 3,000 meters elevation.

Specimens examined: Soto, *Schlim* 1088 (Br, K). Las Vegas, Dept. Santander, *Killip & Smith* 15961 (W).

I have not seen the type of this species, but the specimens cited seem obviously referable here. Since Fritsch did not see any well-developed flowers, his description was necessarily inadequate.

120. Besleria princeps Hanst. Linnaea 34: 317. 1865.

Stems densely short-hirsute; petioles hirsute, 1–3.5 cm long; leaf blades elliptic, up to 13 cm long and 6 cm wide, acute or short-acuminate at apex, rounded or obtuse at base, entire, membranous, tuberculate above, the tubercles surmounted by a long hair, soft-hirsute beneath, the primary veins 7–10 pairs; common peduncle absent, the pedicels solitary, axillary, 2.5–4 cm long, pilose; calyx lobes lanceolate, 15–17 mm long, long-acuminate, erect, nearly free, irregularly sharp-serrate, densely sericeous-villous externally, glabrous within; corolla bright orange, erect, not spurred or gibbous at base, the tube posteriorly about 15 mm long, anteriorly about 20 mm long, 7–8 mm wide at middle, externally pilose, with a dense hairy ring within near base, the throat oblique and densely pubescent within, the limb bilabiate, widely spreading, 20-35 mm wide, the posterior lobes about 1 cm long and wide, the lateral lobes about 15 mm long and 20 mm wide, the anterior about 12 mm long and 14 mm wide, narrowed at base; filaments and anthers densely pilosulous; ovary and style densely villous; disk annular, low, glabrous.

Type: Costa Rica, *Wendland* 1273.

Range: Costa Rica, at 600 to 1,600 meters elevation.

Specimens examined: La Palma, Prov. San José, *Tonduz* 7367 (F, G, W, Y); *M. Valerio* 8 (F); *Pittier* 10181 (W). Pejivalle, Prov. Cartago, *Lankester* 832 (W). La Hondura, Prov. San José, *M. Valerio* 731 (F). San Cristóbal Road, *Stork* 2193 (F). La Estrella, Prov. Cartago, *M. Valerio* 1212 (F). El Copey, Prov. San José, *Stork* 1636 (F). San Antonio de San Ramón, Prov. Alajuela, *Brenes* 5668a (F). Vara Blanca de Sarapiqui, Prov. Alajuela, *Skutch* 3271 (W). Without specific locality, *Brenes* 3997 (F), 5638 (F).

121. Besleria barbensis Hanst. Linnaea 34: 319. 1865.

Herb, 1–1.2 m high; stems angled, sparingly strigose; petioles 2–2.5 cm long; leaf blades broadly elliptic, the largest 15 cm long and 8.5 cm wide, short-acuminate, obtuse or cuneate at base, oblique, membranous, irregularly serrate, substrigose on the veins beneath, the primary veins 12 or 13 pairs; common peduncle

absent, the pedicels solitary, axillary, 1.5–2 cm long, sparingly pilosulous; calyx lobes ovate, 12–15 mm long, free, sharply serrate, sparsely pilosulous externally, puberulous within; corolla orange, erect, not spurred or saccate at base, the tube about 15 mm long, 8 mm wide, sparsely pilose externally, glabrous within, the limb bilabiate, the lobes spreading, the largest 9 mm long and broad; androecium glabrous; ovary pilose at apex; disk annular, thick, glabrous.

TYPE: Volcán de Barba, Prov. Heredia, Costa Rica, *Hoffmann* 45.

RANGE: Central Costa Rica, at middle elevations.

SPECIMENS EXAMINED: Las Nubes, Prov. San José, *Standley* 38549 (W). Irazú, Prov. Cartago, *Tonduz* 4309 (W). Turrialba, Prov. Cartago, *Pittier* (Y).

122. Besleria seitzii Krug and Urban, Notizbl. Bot. Gart. Berlin **1**: 325. 1897.

A branched shrub with whitish, terete, glabrate stems, sparingly substrigose toward apex; petioles short, 12 mm long or less, strigose; leaf blades narrowly elliptic, small, 3–8 cm long, 1.5–2.5 cm wide, attenuate at base, membranous, coarsely dentate, glabrous above, sparingly strigose on the veins beneath, the primary veins 5–7 pairs; common peduncle entirely absent, the pedicels solitary, axillary, 13–16 mm long, slender, substrigose; calyx lobes lanceolate, slightly unequal, 10–13 mm long, including the long, filiform tip, membranous, free, entire, sparsely pilosulous externally, glabrous within; corolla white, strongly oblique, saccate at base posteriorly, the tube slender, 17 mm long, about 3 mm wide at middle, glabrous without and within, a little ventricose upwardly, not contracted in throat, the limb terminal, bilabiate, 18 mm wide or more, the lobes widely spreading, unequal, the larger about 9 mm long; androecium glabrous; ovary and style glabrous; disk angular, glabrous.

TYPE: Kings Bay, Tobago, *Seitz* 13.

RANGE: Tobago.

SPECIMENS EXAMINED: Easterfield, *Broadway* (G, W). Main Ridge, *Broadway* (S). Great Dog River, *Eggers* 5786 (W). Caledonia, *Broadway* (G).

123. Besleria crassa Morton, sp. nov.

Caules et petioli fere omnino glabri; lamina foliorum elliptica crassa, basi cuneata, integra, omnino glabra, utrinque verruculosa; pedicelli pauci glabri; calycis lobi orbiculares imbricati undulati, non nervosi, utrinque glabri; corolla aurantiaco-rubra, obliqua ecalcarata, vix ventricosa, utrinque glabra, limbo terminali bilabiato, lobis magnis patentibus ciliatis undulatis; ovarium glabrum; discus annularis glaber.

Low shrub 15–60 cm high, the stems not branched, terete, almost entirely glabrous; petioles 5–8 mm long, glabrous; leaf blades elliptic, 5–8 cm long, 2.5–4.5 cm wide, cuneate at base, entire, glabrous on both sides, verruculose, the primary veins obscure, 4 or 5 pairs; common peduncle obsolete, the pedicels few, glabrous, about 10 mm long; calyx lobes orbicular, 8 mm long, imbricate, undulate, not veiny, glabrous on both sides; corolla orange-red, about 20 mm long, oblique in calyx, not spurred at base, the tube about 5 mm wide, scarcely ventricose, glabrous on both sides, the throat not contracted, the limb terminal, bilabiate, about 16 mm wide, the lobes very large, the larger 7 mm long and 12 mm wide, the smaller 4 mm wide and long, all ciliate, undulate; androecium glabrous; ovary glabrous; style sparsely pilosulous; disk annular, glabrous.

Type in the Berlin Herbarium, collected between Medellín and Nare, Río Guatapé, Department of Antioquia, Colombia, altitude 2,100–2,250 meters, Feb. 25, 1880, by W. Kalbreyer (no. 1447). Duplicate at Kew.

124. Besleria longipes Urban, Repert. Sp. Nov. Fedde **17**: 165. 1921.

Stems subquadrangular, appressed-pubescent; petioles 5–11 cm long; leaf blades elliptic-oblong, 15–27 cm long, 7.5–12 cm wide, dentate, obtuse and strongly

oblique at base, thin-membranous, conspicuously pellucid-punctate, glabrate except for the puberulous veins beneath, the primary veins 10–12 pairs; common peduncle obsolete, the pedicels 2–4, in flower about 1 cm long, sparsely pilosulous; calyx lobes oblong-lanceolate, 15–18 mm long, acuminate, free, membranous, entire, slightly mucronate, sparingly pilosulous externally, glabrous within; corolla greenish-yellow, 35–40 mm long, not spurred, a little saccate at base posteriorly, the tube strongly curved downward, not ventricose, glabrous on both sides, strongly ampliate upwardly, the throat not contracted, the limb bilabiate, 20–27 mm wide, the lobes strongly unequal; ovary slightly pilosulous at apex; disk semiannular, glabrous.

TYPE: St. Anns, Trinidad, *Broadway* 3185.

RANGE: Trinidad.

SPECIMENS EXAMINED: Maracas Road, *Broadway* 6737 (W), 7247 (F, S), 7389 (S), s. n. (S). Mount Tocuche, *Britton, Hazen & Mendelson* 1279 (Y). Dibe Valley, *Britton, Hazen & Mendelson* 1750 (Y). Without locality, *Fendler* 507 (K), fide Britton.

125. Besleria labiosa Hanst. Linnaea **34**: 324. 1865.

Stems sericeous toward apex; petioles sericeous, up to 4 cm long; leaf blades oblong-ovate, up to 20 cm long and 9.3 cm wide, rounded or obtuse at base, thin-membranous, deeply and irregularly serrate, sparingly pilosulous above, puberulous on the veins beneath, the primary veins 10 or 11 pairs; pedicels glabrate, about 7 mm long; calyx lobes suborbicular, 8–9 mm long, rounded, slightly mucronate below apex, glabrate; corolla yellow, a little saccate at base posteriorly but scarcely spurred, the tube 25 mm long, about 8 mm wide, erect at base, decurved upwardly, glabrous externally, lacking a hairy ring within, not ventricose, the throat a little enlarged, pubescent within, the limb bilabiate, the three lower lobes over 1 cm long, the two upper about 5 mm long; androecium glabrous; ovary minutely puberulous at apex; disk annular, glabrous.

TYPE: Caracas, Venezuela, *Gollmer* (B).

RANGE: Venezuela.

ADDITIONAL SPECIMEN EXAMINED: Caracas, *Moritz* 1725 (B).

126. Besleria calcarata H. B. K. Nov. Gen. & Sp. **2**: 399. 1817.

Gasteranthus pilosus Benth. Plant. Hartw. 233. 1846.

Besleria sodiroana Fritsch, Repert. Sp. Nov. Fedde **18**: 12. 1922.

Stems slender, hirsute; petioles hirsute, up to 5 cm long; leaf blades elliptic, 4–12 cm long and 1.8–6.2 cm wide, serrate almost to base, cuneate at base, membranous, conspicuously hirsute on both sides, the primary veins 14–19 pairs; common peduncle glabrous or nearly so, up to 6 cm long, the pedicels umbellate or subcorymbose, glabrous, 5–6 mm long; calyx lobes lanceolate, 5–7 mm long, membranous, hirsute, denticulate; corolla orange-scarlet, horizontal, about 15 mm long, spurred at base, sparingly pilose, the limb lateral; ovary with a few hairs near apex; disk a bilobed, posterior, glabrous gland.

TYPE: La Pamilla, Quindíu Andes, *Humboldt & Bonpland.*

RANGE: Colombia and Ecuador, at 1,200 to 1,600 meters elevation.

COLOMBIA: Pusuquer, West Andes of Tuquerres, Dept. Nariño, *Lehmann* 5846 (F, K, W).

ECUADOR: San Florencio, *Sodiro* 119/53 (B), type of *B. sodiroana*, 119/52 (B); *André* K1493 (F, K, Y). Tandagú, Prov. Pichincha, *Heilborn* 772 (S).

I have not seen the type of this species, but these specimens agree with the full description. I have not been able to follow Fritsch in separating *B. sodiroana*. The distinctions given do not seem to hold in the material at hand.

The following specimens, cited by me several years ago as *B. quitensis*, are probably referable to *B. calcarata*, rather than to *B. quitensis*. At that time I had not seen any material of the latter species.

COLOMBIA: Armada, Dept. Nariño, *André* 3418 (K, Y), 1492 (K). Altaquer, Dept. Nariño, *André* K1490 (K). Río Cuaiquer, Dept. Nariño, *André* K1491 (K).

ECUADOR: San Pablo, *André* K1487 (K). Mindo, *André* K1489 (K). Corazón, Prov. Pichincha, *André* K1488 (K).

127. Besleria quitensis (Benth.) Hanst. Linnaea **34**: 334. 1865.

Gasteranthus quitensis Benth. Pl. Hartw. 233. 1846.

Stems slender, hirsute; petioles hirsute, up to 4 cm long; leaf blades elliptic, up to 10 cm long and 3.5 cm wide, serrate almost to base, cuneate at base, membranous, sparsely hirsute on both sides, the primary veins about 15 pairs; common peduncle glabrous, 5–6 cm long, the pedicels glabrous, subumbellate, about 5 mm long; calyx lobes lanceolate, about 10 mm long, acuminate, membranous, sparingly denticulate, nearly glabrous; corolla horizontal, about 15 mm long, short-spurred at base, sparingly pilose, the limb lateral; ovary with a few hairs near apex; disk a bilobed posterior glabrous gland.

TYPE: Nanegal, Ecuador, *Hartweg* (K).

RANGE: Ecuador.

ADDITIONAL SPECIMEN EXAMINED: Andes of Quito, *Jameson* (K).

128. Besleria calceolus Fritsch, Repert. Sp. Nov. Fedde **18**: 12. 1922.

Perennial herb; stem slender, inconspicuously strigillose toward apex; petioles 2–4 cm long; leaf blades narrowly or broadly elliptic, up to 18 cm long and 8 cm wide, cuneate at base, membranous, conspicuously but remotely dentate, glabrous above, strigillose on the veins beneath, the primary veins 9 or 10 pairs; common peduncle glabrous, up to 9 cm long, the pedicels subcorymbose, glabrous, 5–13 mm long; calyx lobes green, ovate-lanceolate, about 6 mm long, free, acuminate, entire, sparsely pilosulous; corolla cinnabar-red, horizontal, about 22 mm long, sharply spurred at base, the tube conspicuously ventricose upwardly, sparingly pilosulous, the limb small, lateral; ovary with a few hairs toward apex; disk reduced to a bilobed, posterior, glabrous gland.

TYPE: Montaña de Canelos, Ecuador, *Spruce* 5069 (B).

RANGE: Ecuador.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, K).

129. Besleria timida Morton, Proc. Biol. Soc. Washington **48**: 56. 1935.

Stems slender, strigillose; petioles up to 3 cm long; leaf blades elliptic-lanceolate, up to 9 cm long and 3 cm wide, membranous, attenuate at base, minutely denticulate, strigillose on the veins beneath, the primary veins 6 or 7 pairs; common peduncle thick, glabrous, up to 6 cm long, the pedicels umbellate, glabrous, about 4 mm long; calyx lobes ovate, about 3.5 mm long, free, rounded, a little mucronate, densely glandular-pubescent, erose, ciliate; corolla orange, about 16 mm long, horizontal, long-pilose, spurred (2 mm), the tube becoming 10 mm wide, the throat lateral, about 6 mm wide; ovary puberulous; disk annular, enlarged posteriorly, pubescent.

TYPE: Corazón (?), Prov. Pichincha, Ecuador, *André* K1497 (K).

RANGE: Ecuador.

ADDITIONAL SPECIMEN EXAMINED: Balsapamba, Prov. Bolívar, *André* 4876 (K).

130. Besleria venusta Morton, sp. nov.

Caules crassi, apicem versus dense villoso-tomentosi, deorsum lanato-tomentosi; petioli breves tomentosi; lamina foliorum late elliptica, rotundata, basi obtusa vel rotundata, chartacea, leviter serrata, supra glabra, subtus in venis villoso-tomentosa; pedunculus communis elongatus villoso-tomentosus, pedicellis paucis umbellatis crassissimis villoso-tomentosis; calycis lobi late ovati, liberi vel basi connati, apice rotundati, subaequales integri, externe villoso-tomentosi, intus glabri; corolla rubra, in calyce horizontalis, basi postice calcarata, tubo ventricoso,

externe glabro, limbo laterali parvo; ovarium lateraliter compressum, margine pilosulum; discus annularis brevissimus, postice crassior, margine pilosulus.

Herb, the stems fleshy, densely villous-tomentose toward apex, lanate-tomentose below; petioles short, about 8 mm long, fleshy, tomentose; leaf blades elliptic, 11–13.5 cm long, 5.5–9 cm wide, rounded, the base obtuse or rounded, chartaceous, lightly serrate, glabrous above, villous-tomentose on the veins beneath, the primary veins about 7 pairs; common peduncle elongate, 9–12 cm long, villous-tomentose, the pedicels few, umbellate, 10–14 mm long, very thick, villous-tomentose; calyx lobes broadly ovate, 11–12 mm long, free or connate at base, rounded, subequal, entire, villous-tomentose externally, glabrous within; corolla red, 35 mm long, horizontal in calyx, spurred at base, the tube ventricose, becoming 2 cm wide, glabrous externally, the limb lateral, small; ovary conspicuously compressed laterally, pilosulous on the margins; style pilosulous; disk annular, very low, thin, thickened posteriorly, pilosulous on the margin.

Type in the herbarium of the Naturhistoriska Rijksmuseet, Stockholm, collected at Tandagú, Province of Pichincha, Ecuador, altitude 1,500 meters, July 1920, by O. Heilborn (no. 757).

131. Besleria lateralis Morton, sp. nov.

Caules et petioli tomentosi; lamina foliorum oblongo-lanceolata, basi obtusa, remote serrulata, membranacea, supra fere glabra, subtus in venis tomentosa; pedunculus communis elongatus tomentulosus, pedicellis umbellatis glabratis; calycis lobi ovati, fere liberi, acuti integri venosi, utrinque glabrati; corolla magna, in calyce horizontalis, basi postice calcarata, tubo utrinque glabro, valde ventricoso, limbo laterali; ovarium glabrum; discus postice crassior, pubescens.

Stems tomentose; petioles about 1.5 cm long, tomentose; leaf blades oblong-lanceolate, 21 cm long, 7 cm wide, obtuse at base, membranous, remotely serrulate, nearly glabrous above, tomentose beneath on the veins, the primary veins 8 or 9 pairs; common peduncle elongate, 16–17 cm long, tomentulose, the pedicels umbellate, 6–9 mm long, glabrate; calyx lobes broadly ovate, about 8 mm long, nearly free, acute, entire, veiny, glabrate on both sides; corolla 30–35 mm long, horizontal in calyx, spurred at base posteriorly, the tube glabrous on both sides, strongly ventricose upwardly, 13–15 mm wide at middle, the limb lateral, about 7 mm wide; androecium glabrous; ovary glabrous; style thick, glabrous; disk thickened posteriorly, pubescent.

Type in the Gray Herbarium, collected in the Andes of Quito, Ecuador, in 1855, by J. P. Couthouy.

132. Besleria oncogastra Hanst. Linnaea **34**: 335. 1865.

Shrub, with stems minutely sericeous-tomentose toward apex; petioles up to 15 mm long, sericeous-tomentose; leaf blades elliptic, up to 16.5 cm long and 7.5 cm wide, cuneate at base, membranous, remotely dentate, glabrous above, appressed-pubescent on the veins beneath, the primary veins 5–7 pairs; common peduncle 3–6 cm long, nearly glabrous, the pedicels numerous, subcorymbose, up to 8 mm long, nearly glabrous; calyx lobes ovate, 4–6 mm long, free, a little unequal, the posterior lobe deflexed and obtuse, the others erect, rounded, puberulous on both sides, minutely denticulate; corolla scarlet, horizontal, spurred (the spur rounded 3 mm long), 17–22 mm long, rounded at apex, the limb lateral, about 3 mm wide, the tube glabrous, 4 mm wide at base, 10 mm wide at middle (the location of the throat), narrower toward apex; ovary pubescent; disk enlarged posteriorly, pubescent.

TYPE: Guayaquil, Ecuador, *Ruiz* (B).

RANGE: Ecuador, at 100 to 600 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (W, fragment F). Between Santa Rosa and La Chorita, Prov. Oro, *Hitchcock* 21121 (W, Y). Chacayacu,

Lehmann 6462 (B, K, W). Pilatón, *Sodiro* 119/51 (B). Manabi, *Sodiro* 119/49 (B). Río de Santa Rosa, *André* 4270 (K). Ayabamba, *André* K1495 (K, Y). Tambo Grande, *André* 4278 (K, Y). Guayas, *Heilborn* 7 (S). Without specific locality, *Warscewicz* 13 (B).

133. Besleria tincta Morton, sp. nov.

Caules graciles, superne dense lanati, inferne glabrescentes; petioli strigillosi; lamina foliorum elliptica vel anguste elliptica, acuminata, basi cuneata, crenata, subtus imprimis in venis strigillosa; pedunculus communis elongatus, sparse pilosus, pedicellis umbellatis, fere glabris; calycis lobi fere liberi, ovato-lanceolati, acuminati, integri vel raro denticulati, utrinque puberuli, eciliati, posticus omnino liber, reflexus; corolla coccinea, in calyce horizontalis, basi postice calcarata, tubo minute puberulo, sursum ventricoso, limbo laterali parvo; ovarium puberulum; discus annularis, postice crassior, puberulus.

Herb 20–40 cm high, the stems slender, densely lanate toward apex, glabrescent below; petioles up to 15 mm long, strigillose; leaf blades elliptic or narrowly elliptic, up to 12.5 cm long and 4.5 cm wide, usually smaller, acuminate, cuneate at base, crenate, glabrate above, strigillose beneath, especially on the veins, the primary veins 7–10 pairs; common peduncle up to 7 cm long, sparsely pilose, the pedicels umbellate, about 7 mm long, nearly glabrous; calyx lobes ovate-lanceolate, 6.5–9 mm long, nearly free, acuminate, entire or rarely denticulate, puberulous on both sides, not ciliate, spreading, the posterior one entirely free, reflexed; corolla scarlet, about 20 mm long, horizontal in calyx, spurred at base posteriorly (3 mm), the tube minutely puberulous externally, ventricose upwardly, the limb lateral, the lobes small, erect; androecium glabrous, the anthers connate; ovary and style puberulous; disk annular, thickened posteriorly, pubescent.

Type in the Academy of Natural Sciences, Philadelphia, no. 642,473, collected at Salento, Río Boquía, Department of Caldas, Colombia, altitude 1,600–1,900 meters, July 27, 1922, by E. P. Killip and T. E. Hazen (no. 8798). Duplicates in the New York Botanical Garden and the U. S. National Herbarium.

RANGE: Colombia, at 900 to 2,000 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Cerro Bravo, near Frederica, Dept. Antioquia, *Lehmann* 3228 (K, W). Novilleros, Caldas, *André* 2372 (K, Y). Quindío, *Purdie* (K). Ocaña, *Schlim* 543 (K).

134. Besleria perennis Morton, sp. nov.

Caules apicem versus lanato-tomentosi; lamina foliorum lineari-oblonga, acuta, basi cuneata, membranacea, sinuato-dentata, subtus in venis tomentulosa; pedunculus communis evolutus glaber uniflorus, pedicello brevi glabro; calycis lobi ovati magni liberi acuminati integri, externe tomentulosi, intus puberuli; corolla rubra magna horizontalis, basi calcarata, valde ventricosa, externe puberula, intus glabra, limbo laterali; filamenta puberula; ovarium ubique puberulum; discus postice crassior, pubescens.

Perennial herb, 20–30 cm high, the stems scarcely branched, lanate-tomentose toward apex; petioles short, 2–8 mm long; leaf blades linear-oblong, 4.5–8 cm long, 0.8–1.8 cm wide, acute, cuneate at base, membranous, sinuate-dentate, tomentulose on the veins beneath, the primary veins 7 or 8 pairs; common peduncle about 4 cm long, glabrous, the pedicel solitary, about 6 mm long, glabrous; calyx lobes ovate, about 16 mm long, free, acuminate, entire, tomentulose externally, puberulous within; corolla red, 35 mm long, horizontal in calyx, spurred at base, the tube strongly ventricose, about 15 mm wide at middle, puberulous externally, glabrous within, the limb lateral, about 8 mm wide; filaments puberulous; ovary puberulous; disk thickened posteriorly, pubescent.

Type in the U. S. National Herbarium, no. 1,705,114, collected at Hacienda Salento, Canton Pujili, Province of León, Ecuador, altitude 1,000 meters, Nov. 20, 1934, by Ynes Mexía (no. 6719).

135. Besleria pansamalana Donn. Smith, Bot. Gaz. 16: 197. *pl. 17.* 1891.

Herb, the main stem trailing, up to 2.4 m long, rooting at both nodes and internodes, the apex and lateral branches erect, 0.6–0.9 m high, densely canescent; petioles 1–2 cm long, canescent; leaf blades obovate-oblong, the larger about 13 cm long and 6.5 cm wide, acute at apex, cuneate at base, serrate above the middle, membranous, arachnoid-puberulous beneath, the primary veins 5 or 6 pairs; common peduncle 4–7.4 cm long, canescent, bearing a single pedicel 5–8 mm long; calyx lobes ovate, 10–13 mm long, free, acute, membranous, entire, strigose externally, puberulous within; corolla orange, 30–35 mm long, horizontal, spurred at base (the spur about 3 mm long), the tube lightly puberulent externally, glabrous within, the limb lateral; filaments glabrous; ovary a little compressed laterally, essentially glabrous except for the lightly puberulent lateral ridges; disk annular but greatly enlarged posteriorly, densely pubescent.

TYPE: Pansamalá, Dept. Alta Verapaz, Guatemala, *Tuerckheim* 196 (W).

RANGE: Guatemala, at 1,200 to 1,600 meters elevation.

ADDITIONAL SPECIMENS EXAMINED: Type collection (G, Y). Type locality, *Donnell Smith* 1798 (G, W, Y). Cobán, *Tuerckheim* II. 2281 (Co, F, M, S). Dept. Alta Verapaz, *Lehmann* 1333 (W). Trail from Senahú to Actalá, Dept. Alta Verapaz, *Maxon & Hay* 3322 (W, Y). Finca Mocca, Dept. Alta Verapaz, *Johnson* 165 (W). Cerro Putul, Dept. Quiché, *Skutch* 1827 (W). Purulá, Dept. Baja Verapaz, *Tuerckheim* II. 1740 (W).

Captain Smith originally described the corolla as crimson, but on all specimens which bear notes the color is stated as orange.

136. Besleria ecuadorensis (Fritsch) Morton, comb. nov.

Besleria pansamalana var. *ecuadorensis* Fritsch, Notizbl. Bot. Gart. Berlin 11: 975. 1934.

Stems quadrangular, tomentose; leaf blades elliptic, 9–13 cm long, 4–6 cm wide, cuneate at base, serrulate, subtomentose on veins beneath, the primary veins about 7 pairs; common peduncle tomentose, 4.5 cm long, bearing a single tomentose pedicel about 2 mm long; calyx lobes lanceolate, 10 mm long, acuminate, entire, tomentulose at base externally, puberulous within; corolla 20 mm long, horizontal, spurred, puberulous externally, glabrous within, the tube becoming 10 mm wide at middle, the limb lateral, about 5 mm wide; androecium glabrous; ovary and style glabrous; disk thickened posteriorly, pubescent.

TYPE: Niebly, Ecuador, *Sodiro* 119/50 (B).

The Guatemalan *B. pansamalana* differs in its closely and minutely canescent stems, in its broader calyx lobes, and in its larger corolla, 30–35 mm long.

137. Besleria anomala Morton, sp. nov.

Caules breves et petioli sparse pilosi; lamina foliorum elliptica, rotundata, basi late cuneata, membranacea crenata, supra glabra, subtus imprimis in venis appresso-pubescens; pedunculus communis brevis, pedicellis solitariis vel raro binis, sparse pilosis; calyx campanulatus appresso-pubescens, lobis fere liberis vel in tubum brevem connatis, ovato-lanceolatis, acutis integris; corolla erecta ecalcarata, externe puberula, valde ventricosa, sursum deflexa, limbo laterali, sursum spectante; filamenta dense puberula; ovarium puberulum; discus semiannularis glaber.

Low herb, the stems scarcely 20 cm high, terete, sparsely pilose; leaves clustered at apex of stem, the petioles up to 4.5 cm long, thick, sparsely pilose, the blades elliptic, up to 25 cm long and 8.5 cm wide, rounded, broadly cuneate at base, membranous, crenate, glabrous above, appressed-pubescent beneath, especially on the veins, the primary veins about 6 pairs; common peduncle about 1.5 cm long, the pedicels solitary or rarely paired, up to 5 cm long, sparsely pilose; calyx campanulate, about 11 mm long, appressed-pubescent, the lobes nearly free or

short-cornate at base, ovate-lanceolate, acute, entire, not ciliate, longitudinally nerved; corolla erect in calyx, not spurred, the base slightly saccate posteriorly, about 30 mm long, densely puberulous externally, the tube cylindric at base, about 5 mm wide, deflexed and strongly ventricose upwardly, rounded at apex, the limb lateral not terminal, the lobes very short, erect; filaments short, inserted high in corolla tube, densely puberulous; anthers large, connate, the cells confluent; staminodium well developed; ovary and style densely puberulous; disk thick, semiannular, glabrous.

Type in the Kew Herbarium, collected on moist banks near the Quebrada de la Honda, Colombia, March 1846, by Purdie.

The present species has been known for many years, but no description has ever been published nor any specific name applied to it. In the Genera Plantarum [7] Bentham and Hooker describe a new section of *Besleria* as follows: "*Podobesleria* sectionem format *Besleriis* convenientem staminibus et characteribus aliis essentialibus etsi discus interdum imperfectus. Herbae sunt humiles amplifoliae, pedunculis elongatis 1 v. ∞-floris, corolla ut in *Gasterantho* basi saccata subcalcarato tubo valde ventricoso ore parvo fere *Hypocyrtae*. Huc pertinent specimina Purdieana (pedunculis 1-floris) et Spruceana n. 3904 et Lindeniana 960 pedunculis ∞-floris."

In 1895 Fritsch [8] remarks as follows: "*Besleria* Sect. VII *Podobesleria* Benth. & Hook. Blkr. wie bei *Gasteranthus*. Niedrige Kräuter mit grossen B. and verlangerten Blütenstielen. Discus nicht immer vollständig ausgebildet. Keine Art beschrieben." In 1891 Donnell Smith had referred his species *Besleria pansamalana* to the section *Podobesleria*, but that species does not differ essentially from *Gasteranthus*, as recently noted by Fritsch [9] in the following words: "*Besleria pansamalana* wird von J. D. Smith zur Sektion *Podobesleria* Benth. & Hook. gerechnet. Ich kenne die Formen nicht, welche zur Aufstellung der Sektion *Podobesleria* Anlass gegeben haben. Ich habe die Sektion in meiner Bearbeitung der Gesneriaceen übernommen, ohne mir selbst ein Urteil über deren Wert bilden zu können. *Besleria pansamalana* würde ich ruhig zu *Gasteranthus* Benth. stellen, da sie von den anderen Arten dieser Sektion nicht erheblich abweicht."

I have now had the opportunity of examining the Purdie and Spruce specimens cited by Bentham and Hooker and agree that the section may not be maintained. The Spruce specimen is referable to *B. corallina* Fritsch.

DOUBTFUL SPECIES

138. Besleria aggregata (Mart.) Hanst. in Mart. Fl. Bras. 8[1]:400. 1864.

Hypocyrta aggregata Mart. Nov. Gen. & Sp. 3: 51. 1829.

Shrub; stems densely hirsute; petioles hirsute; leaf blades oblong, up to 30 cm long, subcoriaceous, entire, cuneate at base, hirsute on the veins beneath; common peduncle none; pedicels numerous, up to 1 cm long; calyx about 1 cm long, the lobes linear-lanceolate, free, entire, hirsute; corolla scarlet, urceolate, a little ventricose, finely appressed-pubescent without; disk annular; ovary pilose.

Type: Manacuru, on Rio Japurá, State of Amazonas, Brazil, *Martius*.

The description strongly suggests *Besleria ignea*, and the two species may be identical.

139. Besleria ardens Dcne. ex Linden, Cat. No. 5, 1. 1850.

Description not available.

140. Besleria campanulata Linden, Cat. No. 5, 2. 1850.

Description not available.

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[7] Gen. Pl. 2: 1016. 1876.

[8] Engl. & Prantl. Pflanzenfam. 4[3b]:159. 1895.

[9] Notizbl. Bot. Gart. Berlin 11: 976. 1934.

141. Besleria flavo-virens Nees & Mart. Nov. Act. Acad. Caes. Leop. Carol. **11**:49. 1823.

Besleria luteo-virens Mart. Nov. Gen. & Sp. **3**:45. 1829.

Stems a little pubescent at apex; petioles 2.5–5 cm long; leaf blades narrowly oblong, 12.5–22.5 cm long, 5–7.5 cm wide, cuneate at base, serrate toward apex, slightly pilosulous; common peduncle less than 2.5 cm long, the pedicels numerous, shorter than peduncle; calyx lobes ovate, united to middle, obtusish; corolla yellowish-green, scarcely twice as long as calyx, the tube infundibular, the limb broad.

Type: Ilheos, Bahia, Brazil, *Martius*.

I have seen no material certainly referable to this species, which still remains dubious. Fritsch cites a specimen collected by Riedel (no. 419) as being of this species. There is a specimen of this in the National Herbarium. It is in poor condition and does not seem to agree very well with the above description, which is adapted from that of Martius.

EXCLUDED SPECIES

Besleria ampla Vell. Fl. Flum. 262. 1825; Ic. **6**: *pl. 84*. 1827. Not Gesneriaceae.

Besleria arborea Vell. op. cit. 261; op. cit. *pl. 82*. Not Gesneriaceae.

Besleria bicolor H. B. K. Nov. Gen. & Sp. **2**:398. 1818.=*Alloplectus bicolor* Klotzsch.

Besleria biflora Forst. Fl. Ins. Austr. Prodr. 43. 1786.=*Cyrtandra biflora* Forst.

Besleria bivalvis L. f. Suppl. Pl. 280. 1781.=*Curanga bivalvis* Druce.

Besleria bonodora Vell. Fl. Flum. 261. 1825; Ic. **6**: *pl. 80*. 1827.=*Brunfelsia bonodora* Macbr.

Besleria caerulea Aubl. Pl. Guian. **2**: 631. 1775.=*Schlegelia violacea* Griseb.?

Besleria cestroides Fritsch, Notizbl. Bot. Gart. Berlin **11**:962. 1934.=*Cremosperma cestroides* Morton.

Besleria coccinea Aubl. Pl. Guian. **2**:632. *pl. 255*. 1775.=*Alloplectus coccineus* Mart.

Besleria congestiflora Donn. Smith, Bot. Gaz. **61**: 379. 1916.=*Alloplectus congestiflorus* Morton.

Besleria crassifolia Schott in Schreibers, Nachr. K. Oestr. Naturf. Bras. Anh. 7. 1820.=*Nematanthus* sp.

Besleria cristata L. Sp. Pl. 619. 1753.=*Alloplectus cristatus* Mart.

Besleria cymosa Forst. Fl. Ins. Austr. Prodr. 44. 1786.=*Cyrtandra cymosa* Forst.

Besleria dichrus Spreng. Syst. Veg. **2**: 840. 1825.=*Alloplectus dichrus* DC.

Besleria drymonia Steud. Nom. Bot. ed. 2, **1**: 200. 1840.=*Drymonia calcarata* Mart.

Besleria foliacea Rusby, Mem. Torrey Club **4**: 240. 1895. Not *Besleria*.

Besleria grandiflora H. B. K. Nov. Gen. & Sp. **2**: 401. 1818.=*Campanea grandiflora* Dcne.

Besleria guadalupensis DC. Prodr. **7**: 538. 1839.=*Episcia melittifolia* var. *guadalupensis* Urban.

Besleria hirtella Schott, Oesterr. Med. Jahrb. VI. **2**: 66. 1820.=*Alloplectus* sp.

Besleria hispida H. B. K. Nov. Gen. & Sp. **2**: 39. 1818.=*Alloplectus hispidus* Mart.

Besleria incarnata Aubl. Pl. Guian. **2**: 635. *pl. 256*. 1775. Not *Besleria*.

Besleria inodora Vell. Fl. Flum. 261. 1825; Ic. **6**: *pl. 81*. 1827.=*Brunfelsia* sp.

BESLERIA INSIGNIS Mart. & Gal. Bull. Acad. Sci. Brux. 9²: 37. 1842.=*Solenophora insignis* Hanst.

BESLERIA LUTEA Moc. & Sessé, Fl. Mex. 167. 1887. Not *Besleria.*

BESLERIA MELITTIFOLIA L. Sp. Pl. 619. 1753.=*Episcia melittifolia* Mart.

BESLERIA MOLLIS Hook. ex Steud. Nom. Bot. ed. 2, 1: 200. 1840, nomen nudum. Not *Besleria.*

BESLERIA MOLLISSIMA Spreng. ex Steud. Nom. Bot. 107. 1821, nomen nudum. Not *Besleria.*

BESLERIA PENTAPHYLLA Vell. Fl. Flum. 262. 1825; Ic. 6: *pl. 83.* 1827. Not Gesneriaceae.

BESLERIA PULCHELLA Donn, Hort. Cantabr. 140. 1796, ex Bot. Mag. Curtis 28: *pl. 1146.* 1808.=*Tussacia pulchella* Rchb.

BESLERIA RESUPINATA Moc. & Sessé, Fl. Mex. 167. 1887. Not *Besleria.*

BESLERIA SANGUINEA Pers. Syn. Pl. 2: 165. 1807.=*Alloplectus sanguineus* Mart.

BESLERIA SERRULATA Jacq. Pl. Hort. Schönbr. 3: 21. *pl. 290.* 1798.=*Drymonia serrulata* Mart.

BESLERIA SPECTABILIS H. B. K. Nov. Gen. & Sp. 2: 400. 1818.=*Drymonia spectabilis* Mart.

BESLERIA SURINAMENSIS Miq. Linnaea 22: 471. 1849.=*Trichanthera gigantea* (H. & B.) Nees.

BESLERIA VERRUCOSA Pulle, Rec. Trav. Bot. Neerl. 9: 163. 1912. Not *Besleria.*

BESLERIA VIOLACEA Aubl. Pl. Guian. 2: 630. *pl. 234.* 1775.=*Schlegelia violacea* Griseb.

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UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS
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THE ANDEAN SPECIES OF PILEA

By ELLSWORTH P. KILLIP

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PREFACE

THE present paper by Ellsworth P. Killip, associate curator, division of plants, United States National Museum, is complementary to a key to the species of *Pilea* from the Andean region, which was published early in 1936 in this series, with descriptions of some 30 new species. Unfortunately it was not practicable at that time to include redescriptions of the other species or to present a general view of the group other than as indicated in the key. In the present treatment detailed descriptions of these earlier species are given, together with their synonymy and a citation of the specimens examined. In addition, three species and a single variety are described as new. The number of species treated is 115.

The studies summarized in these two papers are based upon the rich collections assembled by Mr. Killip as a member of three botanical expeditions to the Andes and upon material in the more important herbaria of the United States and Europe, including type and other historic specimens. The area covered embraces Venezuela and adjacent Curaçao, Colombia, Ecuador, Peru, Bolivia, and Chile.

WILLIAM R. MAXON,
Curator, United States National Herbarium.

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THE ANDEAN SPECIES OF PILEA

By Ellsworth P. Killip

INTRODUCTION

Pilea is by far the largest genus of Urticaceae. Weddell in his final monograph [1] of the family recognized 159 species as valid, about 50 of which were said to occur in the Andes of South America. That these species had a very limited range of distribution was indicated by the fact that more than 30 were known from only a single collection and that only 9 of the others were in any sense widely distributed in the Andean countries. Two, *P. microphylla* and *P. pubescens*, occurred throughout the American Tropics, and *P. hyalina* and *P. dendrophila* extended eastward in South America. In the 50 years following the publication of this monograph only 10 species were described from the Andean region.

Because of the large number of specimens of *Pilea* collected by expeditions to the Andes sponsored by the Smithsonian Institution, the New York Botanical Garden, the Gray Herbarium and the Arnold Arboretum of Harvard University, the Field Museum of Natural History, and the Academy of Natural Sciences, Philadelphia, which were submitted to me for identification but which could not be assigned to any known species, I began the preparation of a monograph of all the Andean species. This was completed in 1935 but unfortunately could not be printed in its entirety at that time. Instead, a greatly abridged paper was published,[2] which contained a key to all the Andean species, descriptions of 30 new ones, and a few changes of name and of rank. In this there was no opportunity to present descriptions of the earlier species or to discuss their synonymy. It therefore seems highly desirable that the preliminary survey be followed as soon as possible by this more extensive one.

As the present paper appears in the same volume of the Contributions from the United States National Herbarium as the first, there is little need to reproduce the key or to give diagnoses of the species which were there described as new. A slight alteration to the key is suggested in the discussion of *P. poeppigiana;* for two names in the key, *P. leptophylla* (species no. 55) and *P. macrophylla* (species no. 89), *P. fendleri* and *P. picta* should be substituted, respectively. In order to retain the numbering of the species used in the key I

[1] DC. Prodr. **16** [1]: 32–235. 1869.

[2] Contr. U. S. Nat. Herb. **26** [8]: 367–394. 1936.

have given "a" numbers to the single species, *P. cushiensis*, described in the interim, and to the three species now newly proposed. Numerous transfers of specific names to *Adicea* by Kuntze are omitted from the synonymy.

In the preparation of this revision I have had the opportunity of examining nearly all the type specimens of the Andean species, photographs of which are deposited in the National Herbarium. I wish again to express my appreciation to those in charge of the herbaria I have consulted for the many courtesies extended. These herbaria are indicated thus in the citation of specimens:

A, Arnold Arboretum of Harvard University.
B, Botanisches Musem, Berlin-Dahlem.
Bas, H. W. Bassler Herbarium, consulted at Iquitos, Peru; now on deposit at the New York Botanical Garden.
BM, British Museum (Natural History).
Bo, Boissier Herbarium, Geneva.
Bog, Instituto de la Salle, Bogotá.
Brux, Jardin de l'Etât, Brussels.
BW, Willdenow Herbarium, Berlin-Dahlem.
F, Field Museum of Natural History, Chicago.
G, Gray Herbarium of Harvard University.
Gen, Conservatoire et Jardin Botaniques, Geneva.
Go, Goeldi Museum, Pará.
HNC, Herbario Nacional de Colombia, Bogotá.
K, Royal Botanic Gardens, Kew.
Ma, Jardín Botánico, Madrid.
Mo, Missouri Botanical Garden, St. Louis.
P, Muséum d'Histoire Naturelle, Paris.
Ph, Academy of Natural Sciences, Philadelphia.
Pr, Národní Museum, Prague.
S, Riksmuseet, Stockholm.
US, United States National Museum.
Ut, Rijks Universiteit, Utrecht.
V, Naturhistorisches Museum, Vienna.
Y, New York Botanical Garden.

SYSTEMATIC TREATMENT

PILEA Lindl.

PILEA Lindl. Coll. Bot. *pl. 4.* 1821.
ADICEA Raf. Anal. Nat. 179. 1815, hyponym.

Plants annual or perennial, herbaceous, sometimes suffrutescent, often succulent, repent, decumbent, or erect, monoecious or dioecious; stipules intra-axillary, connate, deciduous or persistent; leaves opposite (those of a pair equal or markedly unequal, similar or very dissimilar), usually petiolate, toothed or entire, trinerved, triplinerved, or rarely penninerved, usually bearing numerous fusiform, linear, punctiform, or rarely stellate cystoliths; flowers unisexual, in unisexual or androgynous clusters, these solitary or forming cymes or panicles; bracts small and deciduous, rarely large and subpersistent; staminate perianth 4-parted (rarely 2- or 3-parted), the stamens as many as the segments; pistillate perianth 3-parted, the middle segment usually much larger than the lateral segments; stigma sessile, penicillate; achene compressed.

I. Microphyllae

1. Pilea microphylla (L.) Liebm. Dansk. Vid. Selsk. Skrivt. V. **2**: 296. 1851.

Parietaria microphylla L. Syst. Nat. ed. 10, 1308. 1759.

Urtica callitrichoides H. B. K. Nov. Gen. & Sp. **2**: 40. 1817.

Pilea muscosa Lindl. Coll. Bot. *pl. 4*. 1821.

Pilea callitrichoides Kunth, Ind. Sem. Hort. Berol. 12. 1846.

Succulent herb, 4 to 30 cm high, glabrous throughout, variable in size and habit; leaves usually crowded, short-petioled, obtuse or subacute at apex, entire, those of a pair unequal, the larger prevailingly obovate, up to 10 mm long, the smaller orbicular or obovate-orbicular, up to 3 mm long, the upper surface transversely striate with linear cystoliths; plants monoecious, rarely dioecious, the flower clusters androgynous or unisexual, sessile or subsessile; achenes ovate, about 0.3 mm long.

Distribution: Throughout the American Tropics from Mexico and southern Florida to Peru and northern Brazil, up to 2,000 meters altitude; often cultivated.

Curaçao: *Boldingh* 5648 (P).

Venezuela.

Sucre: Cristóbal Colón, *Broadway* 9 (G, US, Y). Caripe, *Humboldt & Bonpland* (type of *Urtica callitrichoides*, B, P).

Monagas: Cerro de Turumiquire, *Tate* 351 (US).

Miranda: Las Motasas, *Allart* 185 (US).

Federal District: La Guayra, *Kuntze* 1328 (Y); *Gollmer* in 1853 (B). Caracas, *Pittier* 9551 (G, Gen, US, Y); *Bailey & Bailey* 313 (US); *Ernst* in 1878 (V). El Valle, *Pittier* 11972 (Gen, US, Y).

Aragua: Colonia Tovar, *Fendler* 1240 (G, Gen, K, Ph). Maracay, *Cornelio* 132 (US).

Mérida: Mérida, *Reed* 185 (US).

Colombia.

Magdalena: Santa Marta, *H. H. Smith* 1460 (K, US, Y). Pueblo Viejo, *Seifriz* 317 (US). San Miguel, *Seifriz* 541a (Ph).

Atlántico: Barranquilla, *Elias* 564 (US).

Bolívar: Cartagena, *Heriberto* 342 (US). Turbaco, *Killip & Smith* 14353 (G, US, Y), 14470 (G, US, Y).

Huila: Neiva, *Rusby & Pennell* 458 (G, US, Y).

Santander: Bucaramanga, *Killip & Smith* 16200 (G, US, Y), 16258 (G, US, Y).

Cundinamarca: Nariño, *Pérez* 351 (US).

Antioquia: Medellín, *Archer* 1 (US), 2 (US), 690 (US), 770 (US); *Charelier* 65 (US).

El Chocó: Quibdó, *Archer* 1793 (US).

El Valle: Dagua, *Killip* 5439 (G, US, Y). Río Dagua, *André* 2517 (K). Cali, *André* 442 (K). Cascajal, *André* 3692 (F, G, K). Buga, *Dryander* 94 (B).

El Cauca: Olaya, *André* 2890 (F, G, K, Y). Río Quilcacé, *André* 2823 (K).

Ecuador: *André* K722 (K).

Guayas: Guayaquil, *Mille* 20 (US), 93 (US).

Chimborazo: *André* K723 (K). Pallatanga, *Sodiro* 153/17 (B).

Los Ríos: Guaduas, *Remy* in 1856 (P).

PERU: *Ruiz & Pavón* (B, Ma); *Poeppig* (B).

AMAZONAS: Chachapoyas, *Mathews* 3101 (G, Gen, K).

SAN MARTÍN: Tarapoto, *Spruce* 4028 (B, BM, Brux, G, K); *Ule* 6657 (B, Gen, Go, K); *L. Williams* 6071 (US). San Roque, *L. Williams* 7233 (US). Río Huallaga, *L. Williams* 4082 (US), 6662 (US). Zepelacio, *Klug* 3719 (US).

LORETO: Iquitos, *Killip & Smith* 27500 (US, Y). Puerto Melendez, *Tessmann* 4742 (B).

HUÁNUCO: Piedra Grande, *Macbride* 3690 (F, Gen, US). Cochero, *Poeppig* in 1830 (V).

JUNÍN: La Merced, *Killip & Smith* 24073 (F, US, Y). Paucartambo Valley, *Killip & Smith* 25329 (F, US, Y).

Numerous segregates of *P. microphylla* have been proposed, but nearly all of them appear to represent forms which the species assumes under different environmental conditions. These variations are chiefly in the height of the plant, in its habit, whether it is prostrate or ascending, and in the size of the leaves. Within the Andean countries only three other species of the *P. microphylla* relationship occur: *P. foliosa*, which in reality is more closely allied to *P. diversifolia*, *P. herniarioides*, a creeping plant with filiform stems and different cystolithic marking, and *P. serpyllacea*, distinguished by elongate peduncles and rounder, often crenulate leaves. *Pilea microphylla* is a native of warm, tropical regions, although it has been introduced as a border plant and is grown in pots at high altitudes; *P. serpyllacea* grows only in the high mountains.

2. Pilea foliosa Killip, Contr. U. S. Nat. Herb. **26**: 377. 1936. PLATE 30.

DISTRIBUTION: Central Peru, at 1,200 to 3,000 meters altitude.

PERU.

JUNÍN: Carpapata, 3,000 meters, *Killip & Smith* 24400 (F, US, type, Y). Huacapistana, *Killip & Smith* 24281 (F, US, Y). Chanchamayo Valley, *Schunke* 498 (F, US), 678 (F), 992 (F, US).

EXPLANATION OF PLATE 30.—*Pilea foliosa*, the type specimen. One-half natural size.

3. Pilea serpyllacea (H. B. K.) Liebm. Vid. Selsk. Skrivt. V. **2**: 296. 1851.

Urtica serpyllacea H. B. K. Nov. Gen. & Sp. **2**: 37. 1817.

Urtica thymifolia H. B. K. Nov. Gen. & Sp. **2**: 37. 1817.

Pilea globosa Wedd. Ann. Sci. Nat. III. Bot. **18**: 208. 1852.

Pilea thymifolia Blume, Mus. Bot. Lugd. Bat. **2**: 44. 1855.

Pilea subcrenata Wedd. in DC. Prodr. **16**[1]: 148. 1869. Not *P. subcrenata* Blume, 1855.

Plant very succulent, glabrous, reddish-tinged throughout; leaves subglobose, 1 to 5 mm in diameter, entire or shallowly crenulate, transversely striate with fusiform cystoliths; plants monoecious, or staminate flowers sometimes wholly wanting, the pistillate flowers in long- (5 to 10 mm) peduncled cymes 1.5 to 2 mm wide, the staminate flowers very few to a plant, sessile or subsessile and solitary at the base of the peduncles of the pistillate cymes, the perianth subglobose, about 1 mm in diameter; achenes 0.4 to 0.5 mm long.

DISTRIBUTION: Western Venezuela to Peru and Bolivia, at 2,000 to 3,500 meters altitude.

VENEZUELA.

MÉRIDA: Mucurubá, *Gehriger* 258 (US).

COLOMBIA.

CUNDINAMARCA: Bogotá, *Guevara* 218 (US).

ANTIOQUIA: Medellín, *Triana* 898 (B, K, P, Y).

EL CAUCA: Between Coconuco and Popayán, *Killip* 6888 (B, G, K, Ph, US, Y). Portachuela, *André* 2453 (K). Popayán, *Garcia* 4652 (US).

NARIÑO: Between Almaguer and Pasto, *Humboldt & Bonpland* (B, Herb. Willd. 17422, P, type). Between Pasto and Teindala, *Humboldt & Bonpland* (type of *Urtica thymifolia*, B, BW, P). Río Esmita, *Lehmann* 5411 (B, K). Guaitara Valley, *Stübel* 432 (B). Pasto, *Triana* 899 (HNC, K, P).

ECUADOR: *Sodiro* 153/18 (B), 153/19 (B). "Andes," *Jameson* 481 (B, BM, P, type of *P. subcrenata* Wedd., V). Lusco, *Hall* 28 (B). Chuquiribamba, *André* 4440 (K, Y).

IMBABURA: Pinllar, *Firmin* 369 (US). Ibarra, *Benoist* 3583 (P).

PICHINCHA: Guápulo, *Firmin* 271 (US); *Benoist* 2292 (P). Antisanilla, *Anthony & Tate* 338 (US). Antisana, *Sodiro* 153/20 (B).

TUNGURAHUA: Tungurahua, *Tate* 643 (US). Ambato, *Pearce* (K); *Pachano* 3 (US, Y); *Heinrichs* 32 (Gen).

CHIMBORAZO: Punín, *Anthony & Tate* 425 (US). Chimborazo, *Couthouy* (G). Riobamba, *Rimbach* 136 (US).

LOJA: Between Loja and San Lucas, *Hitchcock* 21445 (US).

PERU: *Ruiz & Pavón* (B, BM, type of *P. globosa*, Bo, Ma); *Jussieu* (P).

CAJAMARCA: Hualgayoc, *Weberbauer* 4054 (B); *Raimondi* 2209 (B). Callacate, *Raimondi* 5639 (B).

HUÁNUCO: Huacachi, *Macbride* 3868 (F, US), 4087 (F, Gen, US). Huánuco, *Macbride* 3512 (F, US); *Pearce* 118 (BM, K). Casapí, *Poeppig* 1381 (V).

LIMA: Río Blanco, *Killip & Smith* 21601 (US, Y). Matucana, *Macbride & Featherstone* 447 (F, US).

JUNÍN: Carpapata, *Killip & Smith* 24334 (F, US, Y). Between Tambo de Viso and Chaupichaca, *Weberbauer* 158 (B).

CUZCO: *Herrera* 51 (B); *Weberbauer* 4892 (B). Urubamba Valley, *Cook & Gilbert* 262 (US), 1035 (US); *Herrera* 2288 (B). Apurimac Valley, *Herrera* 3065 (US). Ollantaitambo, *Pennell* 13657 (Ph).

BOLIVIA.

LA PAZ: Sorata, *Mandon* 1005 (BM, G, Gen, K, Y).

In proposing *Urtica thymifolia* H. B. K. the authors stated that it was very close to *U. serpyllacea*, differing in being smaller in every way and in having suborbicular leaves and a monoecious inflorescence. I have made direct comparison of the types of both of these in the Humboldt Herbarium at Paris and am confident that only a single species is represented. Weddell adopted the specific name *globosa*, taken from a Ruiz and Pavón specimen, for *P. thymifolia*, observing that the latter name was inappropriate. The Peruvian plant may not be conspecific with the one from farther northward. When fresh, it has a reddish hue and the leaves are like little globules, without a vestige of crenation. When dried, this plant falls to pieces, whereas typical *P. serpyllacea* remains fairly intact.

Pilea serpyllacea closely resembles *P. microphylla*, the most satisfactory differentiating character being the well-developed peduncles of *P. serpyllacea*. In herbaria the leaves are nearly orbicular, whereas in *P. microphylla* they are obovate. *Pilea serpyllacea* is a plant of the higher mountains, *P. microphylla* of low elevations though sometimes cultivated at higher altitudes.

The material here cited shows gradations between forms with definitely crenulate leaves, as in the type of *P. subcrenata* Wedd., and those with entire leaves.

Pilea serpyllifolia (Poir.) Wedd. (*Parietaria serpyllifolia* Poir.[3]) was considered by Weddell as synonymous with *P. serpyllacea*. I have seen two specimens of this, the type in the Lamarck Herbarium, from Martinique, and a specimen, also at Paris, bearing the data "Nov. Granata? ex herb. Bonpland." *Pilea serpyllifolia* is distinguished from *P. serpyllacea* and *P. microphylla* by having ciliate leaves

[3] Lam. Encycl. 5: 16. 1804.

with conspicuous cystoliths on their upper surface. In view of the uncertainty in the locality data the species is not included in the present synopsis.

LOCAL NAMES: "Accoicarpa," "quisa," "kkuru-quisa" (Peru).

4. Pilea herniarioides (Swartz) Lindl. Coll. Bot. under *pl. 4.* 1821.

Urtica herniarioides Swartz, Svensk. Vet. Akad. Handl. **8**: 64. *pl. 2, f. 1.* 1787.

Pilea muscosa var. *herniarioides* Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 174. 1856–57.

Pilea microphylla var. *herniarioides* Wedd. in DC. Prodr. **16**[1]: 106. 1869.

Slender, prostrate or creeping, glabrous herb with a filiform stem; leaves of a pair subequal, rhombic-orbicular, 1.5 to 5 mm long and wide, obtuse at apex, abruptly tapering to a filiform petiole subequal to or longer than the blade, entire; plants usually monoecious, the clusters androgynous or unisexual, sessile in the axils of the upper leaves; achenes ovate-elliptic, 0.4 to 0.5 mm long.

DISTRIBUTION: Mexico and southern Florida to Colombia and British Guiana, at low elevations, the type from Hispaniola (BW, type collection!).

CURAÇAO: *Curran & Haman* 3 (G, US, P).

COLOMBIA.

MAGDALENA: Santa Marta, *H. H. Smith* 1222 (B, F, Mo, US, Y).

BOLÍVAR: Turbaco, *Killip & Smith* 14690 (G, US, Y).

CUNDINAMARCA: Quetamé, *Pennell* 1738 (Y).

The Curaçao plant and *Killip & Smith* 14690 are perhaps better referred to *P. microphylla.* The exact limits of *P. herniarioides* are not well established. As it is primarily West Indian, barely entering our limits, I am not attempting to present final conclusions.

II. PARIETARIAE

5. Pilea nerteroides Killip, Contr. U. S. Nat. Herb. **26**: 377. 1936.

Pilea cordifolia Killip, Journ. Washington Acad. Sci. **15**: 50. 1925. Not *P. cordifolia* Benth. 1888.

Slender repent herb, leafy throughout; stem villosulous; stipules ovate, about 1 mm long, persistent; leaves cordate, up to 4 mm long and 5 mm wide, entire, inconspicuously 3-nerved, villosulous, covered with punctiform cystoliths; plants monoecious; staminate flowers borne singly or in pairs, the peduncles 3 to 6 mm long, the segments narrowly ovate; pistillate flowers in 4 to 6-flowered, pedunculate umbels; achenes ovoid, about 0.7 mm long.

DISTRIBUTION: Known only from the type locality.

PERU.

HUÁNUCO: Tambo de Vaca, alt. 4,200 meters, *Macbride* 4395 (B, F, type, Gen, K, US).

6. Pilea nitida Wedd. Ann. Sci. Nat. III. Bot. **18**: 211. 1852.

Plant very slender, up to 10 cm high, glabrous; leaves elliptic-ovate, obtuse at apex and base, 4 to 15 mm long, 2.5 to 8 mm wide, entire or rarely subcrenulate, obscurely 3-nerved, lustrous, bearing linear cystoliths on upper surface; plants monoecious, the flowers in sessile compact androgynous heads barely half as long as the petioles.

DISTRIBUTION: Probably confined to the lower mountain slopes of western Peru.

PERU: *Dombey* [or *Ruiz & Pavón*?] (Gen, Ma, P, type).

CAJAMARCA: San Pablo, alt. 2,300 meters, *Weberbauer* 3872 (B).

LIMA: San Augustín, alt. 400 meters, *Weberbauer* 5244 (B).

7. Pilea lindeniana Wedd. Ann. Sci. Nat. III. Bot. **18**: 210. 1852.
Pilea lindenii Blume, Mus. Bot. Lugd. Bat. **2**: 49. 1855.

Stem subligneous, repent, with numerous suberect, glabrous branches up to 50 cm long; stipules ovate-oblong, 2.5 to 3.5 mm long, subpersistent; leaves ovate-lanceolate, 2.5 to 5 cm. long, 2 to 3 cm wide, acuminate at apex, rounded or cordulate at base, entire, hirsute on both surfaces, the cystoliths inconspicuous, linear and punctiform and very minute above, linear beneath; plants usually monoecious, the inflorescences unisexual; staminate inflorescence paniculiform, borne in the upper axils, the flowers in glomerules and subtended by persistent suborbicular bracts; pistillate inflorescence borne in lower axils, longer than the adjacent petioles.

DISTRIBUTION: Western Venezuela and Eastern Cordillera of Colombia, at 1,500 to 3,000 meters altitude.

VENEZUELA. MÉRIDA: Páramo de Mucuty, *Moritz* 1293 (B, BM). La Asulita, *Reed* 780 (US), 792 (US), 796 (US).

COLOMBIA: *Mutis* 1900 (Ma).

CUNDINAMARCA: *Rodriguez* 36 (US). Falls of Tequendama, *Linden* 799 (BM, Bo, Brux, Gen, P, type, V); *Cuatrecasas* 3087 (US); *Troll* 3737 (B). Bogotá, *Pennell* 2278 (US, Y); *Ariste Joseph* A322 (BM, Bog, US), A888 (US), B80 (US); *Goudot* (P); *Triana* 236 (HNC, K, P), 877 (B, BM, HNC, P); *Goudot* (K, P); *Cuatrecasas* 2586 (US), 3093 (Ma). Quetamé, *Pennell* 1863 (US, Y). Río Arzobispo, *Holton* in 1852 (Y).

META: Villavicencio, *Dawe* 265 (K, US).

This is distinguished from near relatives by the dense indument, by the larger, persistent stipules, and by the conspicuous bracts.

8. Pilea rhombea (L. f.) Liebm. Dansk. Vid. Selsk. Skrivt. V. **2**: 305. 1851.
Urtica rhombea L. f. Suppl. Pl. 417. 1781.

Plant herbaceous; stem and branches slender, glabrous, bearing a few or no cystoliths; stipules up to 1 mm long, soon deciduous; leaves rhombic or ovate, 1 to 3.5 cm long, 1 to 2 cm wide, narrowed to an acute or subobtuse apex, entire, membranous, glabrous or sparingly pubescent with hyaline hairs, sometimes ciliate, the cystoliths linear, obscure, scant on lower surface; plants monoecious, the cymes shorter than the adjacent petioles, androgynous, the staminate flowers few, ebracteate; achenes about 0.7 mm long.

DISTRIBUTION: Venezuela and Colombia, at 1,000 to 2,800 meters altitude.

VENEZUELA: *Lansberg* (B); *Ernst* 458 (BM), 1164 (BM).

FEDERAL DISTRICT: Sanchorquiz, *Eggers* 13445 (US). Galipán, *Pittier* 10448 (Gen, US, Y). Caracas, *Gollmer* in 1852 (B); *Pittier* 11127 (Gen, US).

MÉRIDA: Chama, *Moritz* 1294 (B, BM, K). Páramo de la Sal, *Jahn* 595 (US). Mucurubá, *Gehriger* 203 (Gen, US), 248 (Gen, US).

COLOMBIA.

SANTANDER: Las Vegas, *Killip & Smith* 15541 (G, US, Y). Suratá *Killip & Smith* 16421 (G, US). 16584 (G, US, Y). California, *Killip & Smith* 16989 (G, US), 17025 (G, US, Y), 17090 (G, US, Y). La Baja, *Killip & Smith* 18023 (G, US, Y). Charta, *Killip & Smith* 18849 (G, US, Y).

NORTE DE SANTANDER: Tapatá, *Killip & Smith* 20202 (US). Loso, *Killip & Smith* 20403 (G, US, Y).

CUNDINAMARCA: *Mutis* (type, Linnaean Herbarium); *André* 1302 (F, K, Y). Quebrada de la Vieja, *Cuatrecasas* 3092 (US).
Usaquén, *Ariste Joseph* A329 (Bog, US). Monserrate, *Guevara* 252 (US).

HUILA: Neiva, *Rusby & Pennell* 553 (Mo, US, Y).

EL CAUCA: El Tambo, *Sneidern* 968 (S).

This and the following species have been confused with the West Indian *P. parietaria* (L.) Blume. In typical Jamaican material of that species the leaves

bear numerous elongate conspicuous cystoliths on the lower surface and are prevailingly much larger than in the South American specimens here referred to *P. rhombea* and *P. alsinifolia*. The individual staminate flowers of *P. parietaria* are only about half as large as those of the two South American relatives. Final disposition of this complex group of species must await a more detailed study of West Indian, Mexican, and Central American material.

9. Pilea alsinifolia Wedd. Ann. Sci. Nat. III. Bot. **18**: 211. 1852.

Plant up to 1.5 meters high, with thick succulent glabrous branches, bearing very numerous cystoliths, these usually imparting a whitish or yellowish coloring; stipules up to 1 mm long, soon deciduous; leaves orbicular-ovate or rhombic, 1 to 2.5 cm long, 1 to 1.5 cm wide, obtuse or subacute at apex, entire, glabrous or sparingly hirsute, thick, pale beneath, densely covered with short-linear and punctiform cystoliths above, nearly destitute of cystoliths beneath, sparingly to densely lepidote beneath; plants dioecious, rarely monoecious; staminate inflorescence paniculiform, longer than the leaves, the flowers ebracteate, in dense glomerules; pistillate inflorescence similar, shorter than the leaves.

DISTRIBUTION: Eastern Cordillera of Colombia, at 1,500 to 3,000 meters, and Western Cordillera.

COLOMBIA.

SANTANDER: California, *Killip & Smith* 17014 (G, US, Y). Charta, *Killip & Smith* 19097 (G, US, Y), 19119 (G, US, Y). Tona, *Killip & Smith* 19405 (G, US, Y), 19457 (G, US, Y), 19464 (G, US, Y).

NORTE DE SANTANDER: Tapatá, *Killip & Smith* 20188 (G, US, Y). Ocaña, *Kalbreyer* 1023 (B, K).

CUNDINAMARCA: Bogotá, *Goudot* (P, type).

EL VALLE: Río Dagua, *André* K1673 (F, K, Y).

Goudot's type, which has ciliate leaves sparingly pilose on both surfaces, is exactly matched only by *Killip & Smith* 20188, the rest of the material here cited being glabrous throughout. However, I can not believe that more than a single species is represented by these specimens. The plant has a wholly different aspect from *P. rhombea*, having much stouter, pale stems, thicker leaves, and a more diffuse inflorescence.

10. Pilea argentea Killip, Journ. Washington Acad. Sci. **15**: 290. 1925.

Plant erect, glabrous; stipules soon deciduous; leaves of a node equal, oblong, up to 8 cm long, 3 cm wide, obtusely acuminate at apex, subauricular at base, sessile or nearly so, entire, dark green and bearing linear and punctiform cystoliths above, silvery-lustrous beneath, bearing numerous linear cystoliths; plants dioecious, the inflorescence of staminate plants confined to upper axils, that of pistillate plants at most axils, the flowers in dense glomerules forming panicles 3 to 4 cm long; achenes suborbicular, about 0.5 mm long.

DISTRIBUTION: Eastern Cordillera of Colombia, between 1,500 and 2,000 meters altitude.

COLOMBIA.

HUILA: Neiva, alt. 1,500 to 2,000 meters, *Rusby & Pennell* 654 (Y, type), 938 (US).

CUNDINAMARCA: Fusagasugá, *André* 1895 (K).

11. Pilea tatei Killip, Contr. U. S. Nat. Herb. **26**: 377. 1936.

DISTRIBUTION: Mountains of northeastern Venezuela.

VENEZUELA.

MONAGAS: Cerro de Turumiquire, alt. 2,200 meters, *Tate* 187 (US), 188 (US), 190 (US, type).

12. Pilea aenea Killip, Contr. U. S. Nat. Herb. **26**: 378. 1936.

DISTRIBUTION: Known only from the type specimen, from Colombia.

COLOMBIA: *Mutis* 1908 (Ma, type).

13. Pilea angustata Killip, Contr. U. S. Nat. Herb. **26**: 378. 1936.

DISTRIBUTION: Peru or, more probably in view of other Grisar collections, Ecuador.

ECUADOR OR PERU: *Grisar* (P, type).

III. FALLACES

14. Pilea lippioides Killip, Journ. Washington Acad. Sci. **15**: 296. 1925.

Plant up to 60 cm high, glabrous, the stem repent and suffrutescent below; petioles of a pair unequal, the longer 1.5 to 4 cm long, the shorter usually less than half as long; leaves of a pair similar but unequal (smaller leaf one-third to two-thirds as long as the longer), ovate-elliptic, 2 to 10 cm long, 1.5 to 6 cm wide, acute at apex, rounded or acute at base, coarsely crenate-serrate, penninerved; plants monoecious or dioecious; staminate flowers in slender-peduncled globose heads borne singly in the upper axils, subtended by an involucre of 8 persistent or deciduous, white, pink-striped bracts, the outer 4 orbicular, the inner 4 oblong, the perianth lobes 3, with long slender tips; pistillate flowers in short-peduncled cymes in the axils of the lower leaves; achenes 1.5 mm long.

DISTRIBUTION: Eastern and Central Cordilleras of Colombia, at 2,400 to 3,000 meters altitude.

COLOMBIA.

SANTANDER: Las Vegas, *Killip & Smith* 16054 (G, Gen, US, Y). Between Piedecuesta and Las Vegas, *Killip & Smith* 15559 (G, US, Y).

NORTE DE SANTANDER: Ocaña, *Kalbreyer* 531 (K).

HUILA: Río Paez Valley, *Pittier* 1216 (US, type).

The conspicuous involucrate bracts subtending the staminate flower clusters and a 3-lobed, rather than the normal 4-lobed perianth of the staminate flowers, isolate this species from other South American representatives of *Pilea* of which the staminate inflorescence is known. In the type specimen the leaves at a node are more nearly equal than in the Santander material cited.

Pilea lippioides may be identical with *P. obetiaefolia*, known only from a single pistillate plant, in which the petioles and nerves on the under surface of the leaves are distinctly hirtellous. The specimens here cited as *P. lippioides* have no vestige of pubescence. Until further collecting is done in the northwest part of Colombia and staminate material of *P. obetiaefolia* discovered, it seems best to regard the two as distinct.

15. Pilea obetiaefolia Killip, Journ. Washington Acad. Sci. **13**: 359. 1923.

Erect herb about 30 cm high, the stem simple (?), glabrous, or the younger portions hirsutulous; petioles hirsutulous, those of a pair unequal, the longer up to 4 cm, the smaller up to 2 cm; leaves oblong-lanceolate, 5 to 10 cm long, 2 to 4 cm wide (those of a pair slightly unequal), short-acuminate, crenate-serrate nearly to base, the nerves hirsutulous beneath, the cystoliths fusiform, conspicuous on both surfaces; plants apparently dioecious; pistillate flowers in compact cymes; achenes broadly ovate.

DISTRIBUTION: Known only from the type locality, in the northern part of the Western Cordillera of Colombia.

COLOMBIA.

CALDAS: Cerro Tatamá, alt. 2,700 meters, *Pennell* 10374 (US, type).

16. Pilea hitchcockii Killip, Journ. Washington Acad. Sci. **15**: 297. 1925.

Plant herbaceous, the stem repent, at length erect or suberect, 15 to 30 cm high, ferruginous-strigillose; leaves of a node subequal, narrowly elliptic to

rhombic-ovate, 2 to 10 cm long, 0.7 to 3 cm wide, acute or acuminate, coarsely crenate-serrate or sinuate-serrate, strigillose on the nerves beneath, otherwise glabrous, the narrower leaves penninerved, the broader ones triplinerved; cystoliths faint, linear and subpunctate above, punctate beneath; plants monoecious, the cymes unisexual (staminate at lower nodes, pistillate at upper), slender-peduncled; staminate flowers about 2 mm wide, the segments with a filiform tip about 1 mm long; achenes broadly ovoid, strongly compressed, about 1 mm long.

DISTRIBUTION: Central Ecuador.

ECUADOR:

TUNGURAHUA: Pastaza River, alt. 1,500 meters, *Hitchcock* 21825 (G, US, type, Y).

NAPO-PASTAZA: Tena, alt. 400 meters, *Mexia* 7177 (US).

In the type specimen the leaves are all penninerved, but in the more ample type material at the Gray Herbarium and in the Mexía collection the broader leaves are distinctly triplinerved.

17. Pilea sublobata Rusby, Bull. Torrey Club **28**: 311. 1901.

Plant lax, the stem and branches very slender, glabrous; leaves ovate, oblong, or oblong-lanceolate, 0.5 to 2 cm long, 0.3 to 1 cm wide (rarely a few larger), thin, slender-petioled, coarsely crenate-serrate, glabrous, obscurely triplinerved, the lateral nerves not extending beyond lower quarter of margin; cystoliths linear, faint; plants monoecious, the staminate and pistillate cymes in the axils of the upper leaves, often both in same axil, the peduncles of the staminate slightly longer than those of the pistillate.

DISTRIBUTION: Western Bolivia.

BOLIVIA.

LA PAZ: Unduavi, *Buchtien* 383 (F, K), 794 (B, F, G, US, Y); *Rusby* 1484 (Y, type). Pongo, alt. 3,600 meters, *Tate* 184 (Y).

18. Pilea pauciserrata Killip, Journ. Washington Acad. Sci. **15**: 293. 1925.

Low slender herb, glabrous throughout, the stem repent, at length erect; leaves narrowly obovate or oblanceolate, 6 to 20 cm long, 2 to 5 cm wide, cuneate-attenuate at base, sharply serrate with divaricate teeth, the cystoliths on upper surface linear, on lower punctiform; plants apparently dioecious; staminate flowers sessile or short-pedicelled in few-flowered pedunculate heads.

DISTRIBUTION: Western Bolivia.

BOLIVIA.

LA PAZ: Unduavi, *Buchtien* 2811 (US, type), 8935 (US).

19. Pilea trichosanthes Wedd. in DC. Prodr. **16**[1]: 120. 1869.

Prostrate or repent, much-branched, slender, glabrous herb; stipules about 1 mm long; leaves unequal, opposite or sometimes in 4's due to the presence of a short branch, the larger leaves oblong or oblanceolate, 0.8 to 2 cm long, 3 to 7 mm wide, subacute at apex, cuneate at base, oblique, coarsely serrate above middle, 1-nerved, the smaller ones subrotund, 2 to 4 mm wide, sessile, entire or 2 or 3-toothed, 1-nerved or obscurely triplinerved, the cystoliths filiform, about 1 mm long, conspicuous on the upper surface, fewer and obscure beneath; plants dioecious; staminate cymes sessile or short-peduncled, 3 to 5-flowered, the perianth segments pilosulous without.

DISTRIBUTION: Ecuador.

ECUADOR.

BOLÍVAR: Between Guranda and Bodegas, *Remy* (P, type).

NAPO-PASTAZA: Canelos, alt. 300 to 400 meters, *Mexia* 6881 (US). Tena, *Mexia* 7178 (US), 7211 (US).

This species I placed in *Fallaces* because of the 1-nerved leaves of the type specimen. In the recent Mexía collections the smaller leaves are obscurely

triplinerved. The type has the crowded leaves characteristic of *Diversifoliae*, but in the Mexía specimens the leaves are in pairs.

20. Pilea fallax Wedd. in DC. Prodr. 16[1]: 120. 1869.

Pilea fallax var. *glabra* Wedd. in DC. Prodr. 16[1]: 121. 1869.

Plant suffrutescent or small examples herbaceous, the lower portion of stem stout, woody, radicant, with numerous erect branches up to 50 cm high, densely hirsute above with hyaline hairs; stipules cordate-ovate, up to 8 mm long, persistent; larger leaves ovate or ovate-lanceolate, 2 to 4.5 cm long, 0.8 to 2 cm wide (rarely much smaller), acuminate or subobtuse at apex, acute or rounded at base, coarsely serrate, entire at base, petiolate, dark green and usually densely hirsute with white or brown, hyaline hairs above, appressed-ferruginous-hirtellous on nerves beneath, or the leaves glabrous throughout; smaller leaves broadly ovate or suborbicular, 0.5 to 1.5 cm long, acute; cystoliths linear or fusiform, conspicuous especially on the paler lower surface of the leaves; staminate cymes 8 to 12-flowered, short-peduncled; pistillate cymes 3 to 7-flowered, subsessile or on peduncles up to 6 mm long, the perianth segments subequal, broadly ovate, about 2 mm long, acutish, bearing coarse linear cystoliths without; achene broadly ovate, about 2 mm long, 1.2 mm wide.

DISTRIBUTION: Western Venezuela and Colombia to Ecuador, at 2,700 to 3,000 meters altitude.

VENEZUELA.

MÉRIDA: Mucunután, *Gehriger* 592 (US).

COLOMBIA.

CUNDINAMARCA: Fusagasugá, *Guevara* F.1 (US).

CALDAS: Cerro Tatamá, *Pennell* 10376 (G, US), 10377 (US). Salento, *Pennell* 9336 (G, Ph, US, Y), 9401 (US, Y).

EL CAUCA: Paletará, *Pennell* 6944 (G, Ph, US, Y). Mount Puracé, *Killip* 6777 (G, US). San José, *Pennell & Killip* 7336 (G, Ph, US, Y), 7375 (G, Ph, US, Y); *Pennell* 7559 (G, Ph, US, Y). El Tambo, *Sneidern* 414 (S), 964 (S), 965 (S).

NARIÑO: Cocha, *Stübel* 362b (B). Páramo Chimbalán, *André* 2987 (F, K, Y). Tabano, *André* 3035 (K), K1674 (K, Y), K1675 (K). Quebrada Yacuco, *André* K725 (K), K1676 (K). Minas, *Lehmann* K332 (K).

ECUADOR. "In Andes," *Spruce* 6107 (K, type of *P. fallax* var. *glabra*, V).

PICHINCHA: San Florencio, *André* K724 (K).

TUNGURAHUA: *Spruce* 6106 in part (BM, Gen, K, type, V, Y).

These specimens vary somewhat in degree of indument and shape and size of the leaves. In *Spruce* 6107 and *Sneidern* 414 the foliage is glabrescent. Most of the specimens have short-acuminate or subobtuse leaves, but in this same Sneidern plant they are rather long-acuminate. *Guevara* F.1 is a variant with very small leaves, none of them being over 1 cm long.

21. Pilea vegasana Killip, Contr. U. S. Nat. Herb. **26**: 379. 1936. PLATE 31.

DISTRIBUTION: Eastern Cordillera of Colombia, at an altitude of about 2,600 meters.

COLOMBIA.

SANTANDER: Las Vegas, *Killip & Smith* 16020 (G, US, Y), 16025 (G, US, Y), 16043 (G, Gen, US, type, Y), 16082 (G, US, Y). Mount San Vicente, near Charta, *Killip & Smith* 18968 (G, US, Y).

EXPLANATION OF PLATE 31—*Pilea vegasana*, the type specimen. One-half natural size.

IV. Diversifoliae

22. Pilea nutans (Poepp.) Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 196. *pl. 7, f. 11–13.* 1856–57.

Urtica nutans Poepp.; Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 196. 1856–57, as synonym.

Pilea herrerae Mildbr. in Herrera, Anal. Univ. Cuzco **1**: 147. 1926, name only.

Plant diffuse, much-branched glabrous throughout; leaves appearing in 4's (rarely in 3's), due to the presence at each node of a pair borne on very short branchlets, serrate or crenate-serrate, triplinerved, bearing linear cystoliths on both surfaces, those of the upper surface smaller and more numerous, the larger leaves rhombic-ovate or rhombic-lanceolate, 0.8 to 2.5 cm long, 0.4 to 1.5 cm wide, acute or acuminate at both ends, the petioles 1 to 10 mm long, the smaller leaves rhombic or broadly ovate, up to 5 mm long, sessile or short-petioled; plants dioecious; staminate cymes small, sessile or short-peduncled, few-flowered, the flowers pedicellate, about 1 mm wide, the lobes obtuse, mucronate; pistillate cymes shorter than the leaves; achenes obliquely rounded.

Distribution: Peru and Bolivia, at 800 to 2,200 meters altitude; apparently also in northeastern Colombia.

Colombia.

Norte de Santander: Ocaña, alt. 1,050 meters, *Schlim* 1134 (Brux); alt. 2,100 meters, *Triana* (HNC), 492 (P, labeled "Province d'Antioquia," but clearly a part of the Triana Ocaña collection).

Peru: *Dombey* (P); *Haenke* 1731 (Y).

Huánuco: Cochero, *Poeppig* 1565 (B, BM, Gen, P, type, V).

Junín: Huacapistana, *Killip & Smith* 24274 (F, US, Y). Dos de Mayo, Pichis Trail, *Killip & Smith* 25789 (US, Y). Porvenir, Pichis Trail, *Killip & Smith* 25895 (F, US, Y). Pasla, *Raimondi* 9290 (B).

Cuzco: Río Yanamayo, *Pennell* 14049 (F, Ph, US, Y). Urubamba Valley, *Cook & Gilbert* 1095 (US). Cosñipata Valley, *Herrera* 6 (B). La Maquiña, *West* 8035 (G).

Puno: Ollachea, *Raimondi* 9649 (B).

Bolivia.

Cochabamba: Incachaca, *Steinbach* 8890 (B, F, Ph, S).

Santa Cruz: Province of Sara, *Steinbach* 5028 (B, F, G, Y).

Most of the specimens cited above are without a well-developed inflorescence, either staminate or pistillate, and I have merely reproduced Weddell's description of the inflorescence in the Prodromus, which differed slightly from his earlier one. *Killip & Smith* 25895, a staminate plant, has mature flowers, but they are in compact clusters on filiform peduncles 1.5 to 2 cm long, a floral arrangement at variance with Weddell's description. As the leaves, moreover, are not congested, it is quite possible that this collection represents an undescribed species. The Colombian specimens, also with good staminate flowers, are far out of range and may likewise belong elsewhere. Triana's 492 I cited (p. 384) as *P. rojasiana*, but having compared the additional Colombian material with the type of that species, I am inclined to think that it is better placed in *P. nutans*, under which it was listed by Weddell.

In the six species of the group *Diversifoliae* the leaves are very numerous and appear to be in three's or in four's at a node. This is due to the fact that at most of the nodes there is a very short branch which usually bears a single pair of leaves, one large, one small. Sometimes this second small leaf is wanting, so that there are three leaves associated with the node; sometimes the branch is elongate and

bears several pairs of leaves, of which the lowermost pair is so close to the stem that the leaves appear to be in four's.

LOCAL NAMES: "Chia-chia," "quisa," "yunca-quisa" (Peru).

23. Pilea myriophylla Killip, Contr. U. S. Nat. Herb. **26**: 379. 1936. PLATE 32.

DISTRIBUTION: Ecuador.

ECUADOR: Uarunamaca, *André* K1667 (K, type). "4,000–5,000 feet," *Pearce* (K).

EXPLANATION OF PLATE 32.—*Pilea myriophylla*, portion of type specimen. Natural size.

24. Pilea diversifolia Wedd. Ann. Sci. Nat. III. Bot. **18**: 212. 1852.

Lax much-branched glabrous herb, the stem up to 1.5 meters long; larger leaves of a node cuneate-oblong, 5 to 10 mm long, 1 to 4 mm wide, coarsely 3 to 7-toothed, 1-nerved (secondary nerves faint), the smaller leaves suborbicular, 3 to 5 mm wide, entire or few-toothed, faintly triplinerved, the cystoliths linear, conspicuous, larger but less numerous on the lower surface; plants dioecious; pistillate cymes about 3 mm wide, on peduncles 4 to 5 mm long.

DISTRIBUTION: Central Peru, at 1,500 to 2,200 meters altitude.

PERU: *Ruiz & Pavón* 4677 (B, BM, type, Ma, US).

HUÁNUCO: Muña, *Macbride* 3984 (F, Gen, K, US).

JUNÍN: Dos de Mayo, Pichis Trail, *Killip & Smith* 25885 (F, US, Y).

AYACUCHO: Ccarrapa, between Huanta and Río Apurimac, *Killip & Smith* 22357 (F, US, Y).

25. Pilea weberbaueri Killip, Contr. U. S. Nat. Herb. **26**: 380. 1936. PLATE 33.

DISTRIBUTION: Known only from the type specimen, from central Peru.

PERU.

JUNÍN: Between Palca and Huacapistana, alt. 1,900 to 2,000 meters, *Weberbauer* 2022 (B, type).

EXPLANATION OF PLATE 33.—*Pilea weberbaueri*, the type specimen. About one-half natural size.

26. Pilea pulegifolia (Poir.) Wedd. Ann. Sci. Nat. III. Bot. **18**: 213. 1852.

Urtica pulegifolia Poir. in Lam. Encycl. Suppl. **4**: 224. 1816.

Stem elongate, apparently prostrate but not rooting at nodes, with numerous densely tomentellous, leafy branches; stipules ovate, persistent; leaves ovate, 3 to 6 mm long, 2 to 4 mm wide (those of a node similar but slightly unequal), obtuse at apex, cuneate at base, crenate-serrulate with 2 to 5 serrulations on each side, glabrous, the petioles up to 2 mm long, tomentellous, the cystoliths of upper surface linear, yellow, thick, white and less conspicuous beneath; staminate flowers in small cymes in the upper axils, the peduncles longer than the petioles, puberulent.

DISTRIBUTION: Known only from the type specimen.

PERU: Churugallana, *Dombey* (Bo, F, Ma, P, type).

This and the following species have the curious leaf arrangement of *Diversifoliae*, but unlike other representatives of the section the branches and petioles are densely pubescent.

27. Pilea ramosissima Killip, Contr. U. S. Nat. Herb. **26**: 380. 1936.

DISTRIBUTION: Central Peru, at 2,500 to 2,800 meters altitude.

PERU.

CAJAMARCA: Hualgayoc, *Raimondi* 7092 (B).

HUÁNUCO: Chaglla, *Macbride* 3650 (B, F, K, US, type).

V. IMPARIFOLIAE

28. Pilea filicina Killip, Journ. Washington Acad. Sci. **13**: 355. 1923.

Plant glabrous throughout, frutescent, pinnately branched, the branches divaricate; larger leaf ovate-orbicular, 10 to 13 mm long, 6 to 7 mm wide, 5-crenate

toward apex, abruptly tapering at base, sessile or subsessile; smaller leaf reniform-orbicular, 4 to 6 mm wide, sessile, entire or undulate, triplinerved; cystoliths on upper surface of leaves linear, faint, borne mainly near margin, those on lower surface numerous, punctiform; plants apparently dioecious; pistillate heads subglobose, 3 or 4-flowered, sessile or subsessile; achenes broadly ovate, 1 mm long.

DISTRIBUTION: Eastern Cordillera of Colombia.

COLOMBIA.

CUNDINAMARCA: Paime, *Ariste Joseph* A927 (BM, Bog, US, type, Y).

29. Pilea bassleriana Killip, Contr. U. S. Nat. Herb. **26**: 381. 1936.

DISTRIBUTION: Amazonian Peru, at low elevations; also in southwestern Colombia.

COLOMBIA.

EL CAUCA: La Costa, *Sneidern* 1025 (S, US), 1614 (S).

PERU.

LORETO: Balsapuerto, alt. 150 to 350 meters, *Killip & Smith* 28429 (F, US, Y), 28467 (F, US, Y), 28471 (F, US, type, Y); *Klug* 2870 (F, G, Gen, US, Y). Santa Rosa, below Yurimaguas, *Killip & Smith* 28993 (US, Y). Pongo de Manseriche, *Dennis* (*Killip & Smith* 29145; US, Y); *Tessmann* 4603 (B), 4667 (B); *Mexia* 6355 (US), 6360 (US). Mouth of Río Pastaza, *Dennis* (*Killip & Smith* 29196; US, Y).

30. Pilea daguensis Killip, Contr. U. S. Nat. Herb. **26**: 382. 1936. PLATE 34.

Pilea dendrophila var. *major* Wedd. in DC. Prodr. **16**[1]: 122. 1869.

Plant herbaceous, the stem repent, the branches erect, sulcate, 30 to 40 cm high, stout, glabrous; stipules ovate, 3 to 4 mm long, subpersistent; leaves dark green and glabrous above, bearing faint linear cystoliths, beneath paler, puberulent on the nerves, bearing punctiform cystoliths; leaves of a pair dissimilar and very unequal, the larger ones oblanceolate, 7 to 9 cm long, 1.2 to 3 cm wide, acuminate at apex, oblique and subemarginate at base, borne on petioles 2 to 3 mm long, coarsely crenate-serrate except in the lower third (teeth obtuse or rarely acutish, 8 or 9 to a side), triplinerved, the smaller leaves inequilaterally ovate or suborbicular, 5 to 10 mm long and wide, obtuse, obliquely cordate at base, sessile, entire or slightly undulate, obscurely triplinerved; plants dioecious, the cymes similar, 5 to 8 mm wide, subsessile, the staminate perianth with slender teeth, the segments of the pistillate perianth subequal; achenes nearly orbicular, 0.5 mm wide.

DISTRIBUTION: Western Colombia, at low elevations.

COLOMBIA: *Triana* 889 (B, BM, perhaps part of type collection, K, P, US).

EL CHOCÓ: Tutunendo, *Archer* 2129 (US). Headwaters of Río Tutunendo, *Archer* 2172 (US).

EL VALLE: "Province of Buenaventura, 300 meters," *Triana* (BM, type, also type of *P. dendrophila* var. *major*, HNC). Santa Rosa, Río Dagua, *Killip* 11550 (B, G, Ph, US, Y).

EL CAUCA: El Tambo, *Sneidern* 772 (S).

EXPLANATION OF PLATE 34.—*Pilea daguensis*. *Killip* 11550, one-half natural size.

31. Pilea imparifolia Wedd. Ann. Sci. Nat. III. Bot. **18**: 212. 1852.

Pilea dendrophila Miquel in Mart. Fl. Bras. **4**[1]: 202. 1853.

Decumbent herb with numerous suberect branches; larger leaves rhombic-ovate to elliptic-oblong or obovate, 2 to 6 cm long, 0.8 to 2 cm wide, narrowed at apex, acute or attenuate at base, oblique, sessile or short-petioled, crenate-serrate above middle, obscurely triplinerved, the smaller leaves obovate-orbicular or orbicular-

reniform, 0.8 to 1.5 cm long, strongly asymmetrical, subentire; cystoliths linear on upper leaf surface, punctiform, rarely linear beneath; plants dioecious, the staminate and pistillate cymes sessile or subsessile, few-flowered; segments of staminate flowers mucronulate; achenes about 1 mm long.

ILLUSTRATION: Arch. Mus. Hist. Nat. (Paris) 9: *pl. 7, f. 1–3.*

DISTRIBUTION: Colombia to northern Peru, eastward to the Guianas and Amazonian Brazil; at low elevations. Type from French Guiana, collected by Melinon (no. 55).

COLOMBIA: *Triana* (P); *Dawe* 772 (K, US).

BOLÍVAR: Río Esmeralda, *Pennell* 4541 (US, Y).

EL CHOCÓ: La Concepción, *Archer* 2081 (US). Río Tutunendo, *Archer* 2190 (US).

CALDAS: Salento, *Killip & Hazen* 8786 (B, G, Ph, US, Y).

EL VALLE: La Cumbre, *Killip* 5698 (G, Ph, US, Y).

EL CAUCA: El Tambo, *Sneidern* 895 (S).

PUTUMAYO: Umbría, *Klug* 1931 (B, BM, F, G, US, Y).

ECUADOR.

ORO: Santa Rosa, *Jameson* 734 (BM, K).

PERU.

SAN MARTÍN: Tarapoto, *Spruce* 4434 (B, BM, Brux, K, P, V, Y).

LORETO: Río Itaya, *Killip & Smith* 29308 (F, US, Y), 29515 (F, US, Y), 29572 (F, US, Y). Mouth of Río Santiago, *Mexia* 6365 (US). Mouth of Río Napo, *Tessmann* 3721 (Bas, Gen). Maucallacta, *Klug* 3950 (US). Between Río Ucayali and Río Huallaga, *Huber* 1519 (Go).

JUNÍN: San Nicolás, Pichis Trail, *Killip & Smith* 26038 (US, Y).

These specimens show considerable variation in the size and shape of the larger leaves, those with small leaves approaching *P. filicina* and those with large ones *P. bassleriana.*

LOCAL NAME: "Estrella caracha" (Putumayo).

VI. CENTRADENIOIDEAE

32. Pilea trianaeana Wedd. in DC. Prodr. **16**[1]: 121. 1869.

Stem radicant, at length erect to a height of about 15 cm, puberulous or subglabrous; larger leaf oblong or elliptic-oblong, 8 to 16 cm long, 3 to 6 cm wide, acuminate at apex, acute at base with a slender petiole 1 to 3 cm long, crenate-serrate, glabrous above, often sparsely pilose on the nerves beneath, the smaller leaf similar, 2 to 4 cm long, 0.3 to 1.3 cm wide, acute or acuminate, the cystoliths linear and punctiform, conspicuous on upper surface; plants dioecious; staminate flowers in loose cymes in the upper axils, the peduncles about 1 cm long, the tips of the perianth segments filiform, 1 to 1.5 mm long; pistillate flowers in lax, pedunculate panicles up to 5 cm long; achenes about 1 mm long.

DISTRIBUTION: Western Colombia, at elevations up to 1,000 meters.

COLOMBIA.

BOLÍVAR: Boca Antizales, *Pennell* 4502 (Y).

EL CHOCÓ: La Concepción, *Archer* 1977 (US).

EL VALLE: Río Dagua, *Triana* (BM, P, type).

33. Pilea centradenioides Seem. Bot. Voy. Herald 194. 1854.

Semi-epiphytic herb, the stem repent in the lower part, strigose-hirsute; stipules ovate-oblong, 6 to 10 mm long, thin-membranous, subpersistent; leaves coarsely dentate-serrate, trinerved or subtriplinerved, sparingly pubescent above with hyaline hairs, or glabrous, appressed-pilose on the nerves and veins beneath, white-

striped along the nerves, the cystoliths of the upper surface linear, not more than 0.3 mm long, those of the lower surface similar but slightly longer, obscure, the leaves of a node strongly unequal and dissimilar, the larger elliptic-lanceolate, rarely oblanceolate, 3 to 15 cm long, 1 to 5 cm wide, caudate-acuminate at apex, subcuneate at base, the petiole 1 to 5 cm long, the smaller one ovate or rhombic-ovate, 1 to 2.5 cm long, 7 to 13 mm wide, acute, sessile or with a petiole 3 to 5 mm long; plants dioecious; staminate cymes shorter than the longer of the adjacent petioles, at length up to 2 cm wide, pedunculate, the perianth globose, about 1.5 mm in diameter, the lobes with filiform tips 1.5 to 2 mm long.

DISTRIBUTION: Northwestern Colombia and in the Magdalena Valley; at low elevations:

COLOMBIA.

SANTANDER: Barranca Bermeja, *Haught* 1274 (US), 1305 (US), 1592 (US).

BOYACÁ: El Humbo, *Lawrance* 652 (F, US).

EL CHOCÓ: Cape Corrientes, *Seemann* 1099 (BM, K, type). Tamaná, *Triana* 887 (HNC, K, P).

Haught's field notes state that this is a delicate, semi-epiphytic herb, growing on the base of trees. His specimens are larger in every way than the Seemann type. In the Triana material the leaves are more densely pubescent, and their teeth more rounded.

34. Pilea seemannii Killip, Contr. U. S. Nat. Herb. **26**: 382. 1936.

Pilea variegata Wedd. in DC Prodr. **16** [1]: 123. 1869. Not *P. variegata* Seem., 1854, a transfer of *Urtica variegata* Spreng.

Stem repent at base, at length erect, 25 cm high or more, appressed-ferruginous-hirsute; leaves of a node strongly unequal and dissimilar, the larger one ovate or elliptic-lanceolate, 6 to 11 cm long, 2 to 3 cm wide, oblique, acuminate at apex, sharply serrate, glabrous and longitudinally white-fasciate above, appressed-hirsute on the nerves, the petiole up to 5 mm long, the smaller leaf ovate or orbicular-ovate, 5 to 8 mm long, rounded or cordulate, crenate-serrate, sessile; cystoliths on upper surface of leaves very conspicuous, linear, nearly 1 mm long, straight or bent, numerous, those of the lower surface few and inconspicuous; plants dioecious, the staminate and pistillate cymes similar, 8 to 10 mm wide, the peduncles slender, 3 to 6 mm long; staminate perianth with filiform lobes; pistillate perianth with subequal segments; achenes ovate, 1 to 1.5 mm long.

DISTRIBUTION: Western Colombia, at low elevations.

COLOMBIA.

EL CHOCÓ: Alt. 100 meters, *Triana* 888 (B, BM, HNC, K, P, US). Cape Corrientes, *Seemann* (BM, type of *P. variegata* Wedd., P).

EL VALLE: Córdoba, *Killip* 5117 (G, Ph, US, Y).

This is a striking plant in the dense jungle about Córdoba. The numerous erect branches arise in clumplike masses from the thick repent stem and bear nearly equally spaced, distichous leaves, conspicuously marked above along the nerves with white lines. In the type specimen the larger leaves are ovate; in Triana's no. 888 elliptic-lanceolate.

Many of the Triana specimens of *Pilea* are labeled "Prov. de Barbacoas y Chocó." As many of the species represented by them are of a very local distribution, I believe it is an error to assume from Triana's records that the species occurs in both southwestern and northwestern Colombia.

35. Pilea costata Killip, Contr. U. S. Nat. Herb. **26**: 382. 1936.

DISTRIBUTION: Known only from the type locality, eastern slopes of the Andes of Peru.

PERU.

JUNÍN: Eneñas, alt. 1,700 meters, *Killip & Smith* 25638 (US, type).

36. Pilea pichisana Killip, Contr. U. S. Nat. Herb. **26**: 383. 1936.

DISTRIBUTION: Known only from the type locality, eastern slopes of the Andes of Peru.

PERU.

JUNÍN: Dos de Mayo, Pichis Trail, alt. 1,800 meters, *Killip & Smith* 25876 (F, US, type, Y).

36a. Pilea scandens Killip, sp. nov. PLATE 35.

Suffrutescens, scandens, glaberrima, ramosissima, dioica; stipulae minimae, deciduae; folia serrata vel crenato-serrata, trinervia, cystolithis fusiformibus, in pagina superiore elevatis, laminis in eodem jugo inaequimagnis et dissimilibus, majore lanceolato-ovata, acuminata, cordulata, breviter petiolata, minore ovato-reniformi vel cordato-reniformi, sessili; cymae ♀ 3 vel 4-florae, breviter pedunculatae.

Plant scandent, suffrutescent, glabrous throughout, much-branched, the branches slender, elongate; stipules narrowly ovate, about 0.5 mm long, acute, soon deciduous; leaves thick, serrate or crenate-serrate (teeth usually incurved, mucronulate), trinerved, asperulous on both surfaces, dark green above, black-punctate and paler beneath, with the nerves and veins much darker than the leaf surface, the cystoliths short-fusiform, obscure, slightly elevated on the upper surface; leaves of a node unequal and dissimilar, the larger lance-ovate, 1.5 to 3 cm long, 8 to 13 mm wide, acuminate at apex, cordulate or rarely slightly narrowed at base, the petiole 1 to 2 mm long, the smaller leaf ovate-reniform or cordate-reniform, 4 to 5 mm long, 5 to 9 mm wide, sessile, subacute at apex; plants dioecious; pistillate cymes (undeveloped) very short, 3 or 4-flowered, the peduncles about 1 mm long, the perianth segments unequal.

Type in the herbarium of the Riksmuseum, Stockholm, collected in virgin forest, La Costa, near El Tambo, Department of El Cauca, Colombia, altitude 1,300 meters, July 28, 1936, by Kjell von Sneidern (no. 881). Duplicate at US.

DISTRIBUTION: Central and Western Cordilleras of Colombia, at 1,300 to 1,800 meters altitude.

ADDITIONAL SPECIMENS EXAMINED:

COLOMBIA.

CALDAS: Río Santa Rita, near Salento, *Killip & Hazen* 10129 (G, Ph, US, Y).

EL CAUCA: La Gallera, Micay Valley, *Killip* 7678 (G, Ph, US).

This last specimen was cited (p. 384) as *P. rojasiana;* it was sterile, and I believed at the time that in all probability it represented an undescribed species. Better material collected by Sneidern permits a diagnosis. In general habit this species resembles *P. rojasiana*, but the larger leaves are of a different shape, the toothing of the leaves is more pronounced, and the cystoliths are dissimilar.

EXPLANATION OF PLATE 35.—*Pilea scandens*, the type specimen. One-half natural size.

37. Pilea rojasiana Killip, Contr. U. S. Nat. Herb. **26**: 383. 1936.

DISTRIBUTION: Southwestern Colombia.

COLOMBIA.

EL CAUCA: San José, near San Antonio, Western Cordillera, west of Popayán, alt. 2,400 to 2,700 meters, *Pennell & Killip* 7373 (US, type); *Sneidern* 1396 (S).

Triana's no. 492, cited under this species on page 384, is better placed in *P. nutans*. *Killip's* no. 7678, which was also cited as *P. rojasiana*, is rather *P. scandens*, as noted above.

38. Pilea crugeriana Wedd. in DC. Prodr. **16**[1]: 122. 1869.

Succulent suffrutescent herb, glabrous throughout; stem densely covered with obscure linear cystoliths; stipules early deciduous; leaves of a node very unequal but rather similar in outline, coarsely crenate-serrate nearly to base, caudate-acuminate at apex, subrotund at base, 3-nerved (lateral nerves extending to base

of acumen), bearing on both surfaces numerous small stellate cystoliths with 3 slender rays, the larger leaves ovate-lanceolate, 3 to 12 cm long, 1 to 3 cm wide, with petioles up to 1.2 cm long, the smaller leaves ovate, 1 to 2.5 cm long, 6 to 15 mm wide, subsessile; plants monoecious (always?), the cymes unisexual or androgynous, subsessile, shorter than the adjacent petioles, the staminate flowers sessile, the pistillate (at most only a very few to a cyme) short-pediceled.

DISTRIBUTION: Venezuela.

VENEZUELA: *Crüger* 46 (K, type); *Gollmer* in 1852 [4] (B). Dos Aguados, *Ernst* 1706 (BM).

ARAGUA: Between El Castaño and summit, alt. 1,100 meters, *Pittier* 13898 (US).

Although not noted by Weddell, the foliar cystoliths of *P. crugeriana* are 3-rayed, similar to those of *P. marginata* and *P. triradiata*. Both of these species, however, have the leaves at a node equal and similar, and in the present treatment occupy a position remote from *P. crugeriana*.

39. Pilea haenkei Killip, Contr. U. S. Nat. Herb. **26**: 384. 1936.

DISTRIBUTION: Known only from the type specimen.

PERU: "Montaña," *Haenke* 1870 (Pr, type).

40. Pilea macrocystolithica Killip, Contr. U. S. Nat. Herb. **26**: 384. 1936.

Plant herbaceous, glabrous throughout, the stem simple, about 30 cm high, densely covered with longitudinal, linear cystoliths; stipules triangular-ovate, about 1.5 mm long, obtuse, deciduous; leaves of a node dissimilar and unequal, the larger ovate or ovate-lanceolate, 4 to 6 cm long, 2 to 3 cm wide, obtuse or obtusely acuminate at apex, rounded at base, short- (3–8 mm) petiolate, serrulate nearly to base (serrulations with filiform tips), trinerved, the smaller leaves suborbicular, 1.5 to 2 cm wide, subsessile; cystoliths of upper surface of the leaves very numerous, linear, elevated, 0.7 to 0.8 mm long, those of the lower surface shorter and obscure; plants apparently dioecious,the staminate cymes subglobose, the peduncles about 2 cm long.

DISTRIBUTION: Known only from the type specimen.

PERU: "Montaña," *Haenke* 1860 (Pr, type).

In the original account of this species a line in the description of the cystoliths on page 385 was omitted. A redescription is therefore here presented.

41. Pilea hydrocotyliflora Killip, Contr. U. S. Nat. Herb. **26**: 385. 1936.

DISTRIBUTION: Known only from the type locality, in the northern part of the Eastern Cordillera of Colombia.

COLOMBIA.

NORTE DE SANTANDER: Ocaña, alt. 1,800 meters, *Kalbreyer* 691 (B, type, K).

42. Pilea macrantha Killip, Contr. U. S. Nat. Herb. **26**: 385. 1936.

DISTRIBUTION: Known only from the type locality, in southwestern Colombia.

COLOMBIA.

NARIÑO: Alto del Tabano, Cordillera de Pasto, *André* K1670 in part (K, type).

43. Pilea tetrapoda Killip, Contr. U. S. Nat. Herb. **26**: 386. 1936.

DISTRIBUTION: Known with certainty only from the type locality, in central Ecuador.

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[4] The words "Caracas, *Gollmer*" have been added to Gollmer's original labels and are in another's writing. Most of the Gollmer specimens represent very rare species, not re-collected about Caracas during the course of intensive exploration subsequent to Gollmer's time. I suspect that these plants were actually collected in some other part of Venezuela.

COLOMBIA.

NARIÑO: Alto del Tabano, Cordillera de Pasto, *André* K1670 in part (K). Tambo Savanilla, *André* K1671 (K).

ECUADOR.

TUNGURAHUA: Palmera, Río Pastaza, between Baños and Mera, alt. 1,200 meters, *Tate* 665 (US, type).

As noted on page 386, the Colombian specimens are doubtfully referred here.

VII. FLEXUOSAE

44. Pilea flexuosa Wedd. Ann. Sci. Nat. III. Bot. **18**: 218. 1852.

Pilea hazeni Killip, Journ. Washington Acad. Sci. **13**: 355. 1923.

Plant glabrous throughout, the stem repent or scandent, much branched, the younger portion stramineous; stipules ovate-orbicular, 4 to 6 mm long, persistent; leaves of a pair dissimilar and unequal, rarely similar and subequal, crenate-serrate, subcoriaceous, the cystoliths linear, numerous and conspicuous, the larger leaves ovate-lanceolate, rarely broadly ovate, 2 to 6 cm long, 1.5 to 4 cm wide, acuminate at apex, rounded or cordulate at base, the petioles 1 to 3 cm long, the smaller leaves suborbicular, 1 to 2 cm wide, abruptly acute, cordulate, the petioles 5 to 10 mm long; plants dioecious; pistillate cymes few-flowered, borne in the upper axils on filiform peduncles; achenes broadly ovate, nearly 2 mm long.

DISTRIBUTION: Central Cordillera of Colombia and northern Ecuador.

COLOMBIA.

CALDAS: Quindío mountains, *Goudot* (BM, P, type). Salento, alt. 1,600 to 1,800 meters, *Killip & Hazen* 9007 (US), 10121 (G, Ph, US, type of *P. hazeni*, Y).

ECUADOR.

PICHINCHA: Mount Pichincha, *Jameson* 789 (BM, Gen, K, US). Mount Corazón, *Sodiro* 153/26 (B). Lloa Valley, *Hall* 5 (K).

Weddell placed this among the species with similar and subequal leaves; in the type they are, however, rather strongly dissimilar, though less so than in the type of *P. hazeni* and in the other Killip and Hazen specimen. In the Ecuadorean material the leaves at a node are more nearly equal and more similar.

45. Pilea cymbifolia Rusby, Bull. Torrey Club **28**: 311. 1901.

Pilea urerifolia Rusby, Bull. Torrey Club **28**: 312. 1901.

Plant suffrutescent, erect, 30 cm high or more, glabrous throughout; stipules ovate, 4 to 8 mm long; larger leaf elliptic-lanceolate, 8 to 20 cm long, 2 to 7 cm wide, caudate-acuminate, crenate-serrate to base, often subfalcate, petiolate; smaller leaf ovate-lanceolate, 1.5 to 3.5 cm long, 0.5 to 1.2 cm wide; cystoliths on upper surface minute, punctiform, wanting beneath; plants dioecious or rarely monoecious; staminate flowers in dense globose heads 5 to 8 mm wide, on slender peduncles up to 1.5 cm long; pistillate flowers in once or twice-dichotomous cymes much shorter than the adjacent petioles; achenes ovate, about 1.5 mm long.

DISTRIBUTION: Western Bolivia, at 1,000 to 2,400 meters altitude.

BOLIVIA: Río Tocorani, *Herzog* 2305 (B, Gen, V).

LA PAZ: Yungas, *Rusby* 1482 (BM, G, K, Ph, US, Y, type). Sorata, *Rusby* 1480 (F, US, Y). Unduavi, *Rusby* 1481 (Y, type of *P. urerifolia*). Sacramento, *Bang* 2374 (A, B, BM, F, G, Gen, K, Mo, Ph, US, V, Y). Coroico, *Buchtien* 3751 (Gen, Y), 3752 (US, Y), 3753 (Y).

This species in many details is similar to *P. capitellata*, a plant apparently with the opposite leaves equal and similar. *Pilea urerifolia* appears to be only a form of *P. cymbifolia* with proportionately broader leaves.

VIII. Dauciodorae

46. Pilea urticella Wedd. in DC. Prodr. 16[1]: 157. 1869.

Slender repent herb, with numerous erect or ascending, pilosulous branches up to 12 cm long, leafy throughout; leaves ovate, 3 to 10 mm long, 2 to 6 mm wide, subobtuse at apex, short-petiolate, incised-serrate, thin-membranous, bearing a few linear cystoliths, sparingly pilosulous above, hirsute on nerves beneath; plants monoecious, the inflorescences androgynous, few-flowered, subglobose, up to 5 mm wide, borne in the upper axils on slender peduncles 1.5 to 2 cm long; achenes ovate, about 1 mm long.

Distribution: Known only from the type locality, in north-central Venezuela, at 1,200 meters altitude.

Venezuela.

Aragua: Colonia Tovar, *Fendler* 2429 (G, Gen, type, K, Mo, Ph).

The appearance of this plant, with incised leaves, suggests *Urtica urens*.

47. Pilea lamioides Wedd. Ann. Sci. Nat. III. Bot. **18**: 213. 1852.

Plant glabrous throughout, the stem simple, slender, up to 12 cm high; leaves ovate, 1 to 3 cm long (lower as short as 0.3 cm), 0.6 to 2 cm wide, coarsely crenate-dentate, obtuse; cystoliths obscure, linear above, punctiform beneath; plants monoecious, the cymes at the summit of stem, the staminate flowers short-pediceled in sessile clusters, the pistillate sessile in short-peduncled clusters; achenes less than 0.5 mm long.

Distribution: Known positively only from the Department of Lima, Peru, at low elevations.

Peru: *Dombey* (P, type); *Pavón* (P).

Lima: San Gerónimo, *Macbride* 5910 (F, K, US). Atocongo, *Pennell* 14751 (Ph, Y). Amancais, near Lima, *Weberbauer* 1594 (B). Hupacá, *Raimondi* 285 (B).

This is an easily recognized species, resembling *Lamium purpureum*.

48. Pilea dombeyana Wedd. Ann. Sci. Nat. III. Bot. **18**: 221. 1852.

Pilea orbiculata Killip, Journ. Washington Acad. Sci. **15**: 53. 1925.

Low, succulent, glabrous herb; stipules broadly ovate, persistent; leaves borne mainly near end of branches, nearly orbicular, 0.7 to 2.5 cm long and wide, short-petiolate, often cartilaginous-thickened at margin; cystoliths fusiform, very faint; plants monoecious or dioecious, the heads unisexual; staminate flowers sessile in globose clusters in a few-branched panicle; pistillate flowers in small, densely-flowered, sessile or subsessile cymes.

Distribution: Probably confined to the high mountains of central Peru.

Peru: "Andes," *Dombey* (P, type); *MacLean* (K); "*Herb. Hooker* 2031" (Y). Between Callean and Pelechuco, alt. 3,600 meters, *Pearce* in 1864 (K).

Huánuco: Chasqui, *Macbride* 3289 (B, F, type of *P. orbiculata*, Gen, K, US).

Pilea dombeyana was wrongly placed by Weddell in the group with long-peduncled pistillate cymes. In all the specimens here cited the pistillate cymes are sessile, or very nearly so, and much shorter than the petioles.

49. Pilea serratifolia Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 235. 1856–57.

Plant herbaceous, glabrous throughout, the stem erect or ascending, with several short alternate branches 10 to 15 cm long; stipules broadly ovate, 3 to 6 mm long, divaricate, persistent; leaves ovate, 1 to 3 cm long, 1 to 2.5 cm wide, acute at apex, rounded or subcuneate at base, sharply serrate to base, glaucescent beneath; staminate flowers in a dense globose head, solitary or in 2's, on slender peduncles borne in the upper axils; pistillate cymes sessile in the lower axils; achenes about 1 mm long.

DISTRIBUTION: Northern Ecuador.

ECUADOR.

PICHINCHA: Mount Pichincha, *Jameson* 834 (BM, Gen, K, type, US); *Sodiro* 153/23c (B).

50. Pilea strigosa Wedd. Ann. Sci. Nat. III. Bot. **18**: 225. 1852.

Pilea repens var. *strigosa* Wedd. in DC. Prodr. **16**[1]: 156. 1869.

Stem repent at base, with few or numerous lax, ferruginous-hirsutulous branches; stipules ovate, about 3 mm long, persistent; leaves suborbicular to broadly ovate, 0.8 to 2.5 cm long, 0.8 to 1.5 cm wide (extremes 4.5 cm long, 3 cm wide), rounded or subacute at apex, rounded or subtruncate at base, crenate-serrate, usually strigose-pilose above, ferruginous-hirsutulous on the nerves beneath; cystoliths punctiform or short-linear; plants usually monoecious; cymes unisexual, but often both kinds borne in the same axil; staminate flowers in compact, subglobose, usually long-peduncled cymes, the perianth up to 2 mm in diameter, the lobes with conspicuous foliaceous tips; pistillate inflorescence paniculate, pedunculate; achenes ovate, about 1 mm long.

DISTRIBUTION: Northern and central Peru and western Bolivia, up to 3,000 meters altitude.

PERU: *Mathews* 2031 (BM, G, K, P, type).

LORETO: Santa Rosa, Lower Río Huallaga, *Killip & Smith* 28835 (F, US, Y), 28843 (US, Y).

HUÁNUCO: Cochero, *Poeppig* 1552 in part (B, V).

JUNÍN: Dos de Mayo, Pichis Trail, *Killip & Smith* 25795 (US).

BOLIVIA.

LA PAZ: Yungas, *Bang* 687 (B, BM, F, G, K, Ph, US, V, Y). Unduavi, *Buchtien* 85 (B, BM, F, G, Gen, Y), 795 (US), 8938 (US), 8939 (US); *Julio* 462 (US); *Rusby* 1485 (Y).

Much of the Bolivian material was distributed as *P. dauciodora*, a species which *P. strigosa* resembles in general appearance. In addition to being densely pubescent, the cystolithic marking is quite dissimilar.

The range of altitude at which the plant grows is unusually great, the specimens from northern Peru having been collected at 135 meters and Buchtien's no. 85 at 3,300 meters.

Pilea repens, a West Indian plant with androgynous heads and linear fusiform cystoliths, is certainly a distinct species.

51. Pilea pusilla Krause, Bot. Jahrb. Engler **37**: 530. 1906.

Plant slender, glabrous, up to 10 cm high, the stem filiform; stipules minute, soon deciduous; leaves suborbicular or subreniform, up to 1 cm long and 1.5 cm wide, obtuse at apex, subtruncate at base, sharply serrulate, the cystoliths all punctiform; plants monoecious, the flower clusters unisexual or androgynous, forming slender-peduncled panicles; achenes ovate, about 0.75 mm long.

DISTRIBUTION: Known only from the type locality, in central Peru.

PERU.

JUNÍN: Palca, alt. 1,900 to 2,000 meters, *Weberbauer* 2023 (B, type).

52. Pilea delicatula Killip, Journ. Washington Acad. Sci. **15**: 51. 1925.

Plant up to 10 cm high, glabrous throughout; leaves ovate-lanceolate, 1 to 1.5 cm long, 0.5 to 1 cm wide, acute, rounded or subcuneate at base, sharply serrate, the teeth mucronate; cystoliths on upper surface few, linear, faint, punctiform on lower surface; plants dioecious (?); pistillate flowers in globose, about 6-flowered, short-pedunculate cymes, the flowers pendent; achenes broadly ovate, 1.5 mm long.

DISTRIBUTION: Known only from the type locality, in central Peru.

PERU.

HUÁNUCO: Tambo de Vaca, alt. 4,000 meters, *Macbride* 4400 (B, F, type, Gen, K, US).

53. Pilea elliptica Hook. f. Fl. Antarct. 344. 1847.

Pilea chilensis Wedd. Ann. Sci. Nat. III. Bot. **18**: 221. 1852.

Pilea pedunculata Blume, Mus. Bot. Lugd. Bat. **2**: 46. 1852.

Pilea uliginosa Phil. Linnaea **30**: 199. 1859 or 1860.

Plant glabrous throughout, the stem radicant below, much-branched, the main branches ascending, bearing short axillary branchlets with small leaves; leaves rhombic or rhombic-ovate, 0.7 to 2.5 cm long, 0.4 to 2 cm wide, crenate-serrate nearly to base, obtuse or acutish at apex, acute at base, triplinerved (lateral nerves reaching scarcely to upper third), crenate-serrate, the cystoliths above linear, faint, few, beneath punctiform, numerous; plants monoecious (sometimes dioecious?), the cymes unisexual, slender-pedunculed, globose; staminate perianth with very short tips; achenes orbicular-reniform, about 1 mm long, 1.5 mm wide.

DISTRIBUTION: Central and southern Chile, at low elevations, the type collected by Charles Darwin in the Chonos Archipelago.

CHILE: *Gay* (B, Y); *Née* (Ma); *D'Urville* (P); *Dombey* (P). Río Manso, *Reiche* in 1896 (B). Bureo, *Claude Joseph* 3994 (US).

ATACAMA: Freirina, *Claude Joseph* 1862 (BM, US, Y).

CONCEPCIÓN: *Bridges* (B).

VALDIVIA: Valdivia, *Bridges* 741 (BM, V, Y); *Gay* 235 (Gen, P); *Philippi* 28 (B, P, US, V); *Buchtien* in 1897 (US), in 1899 (Gen, V), in 1905 (US). Panguipulli, *Claude Joseph* 2352 (US); *Hollermeyer* 511 (B); *Werdermann* 1954 (B). Valenzuela Island, *Lechler* 409 (B, BM, Brux, P, V). Corral, *Gunckel* 68 (BM).

LLANQUIHUE: Puerto Montt, *Philippi* (type collection of *P. uliginosa;* B, BM, G). Peulla, *Pennell* 12653 (F, Ph, US, Y).

CHILOE: *Gay* 68 (P); *Cuming* 40 (BM). Castro, *Pennell* 12608 (Y).

Pilea uliginosa appears to be merely a depauperate form of *P. elliptica.*

54. Pilea dauciodora (R. & P.) Wedd. Ann. Sci. Nat. III. Bot. **18**: 223. 1852.

Urtica dauciodora R. & P.; Wedd. Ann. Sci. Nat. III. Bot. **18**: 223. 1852, as synonym.

Pilea uncidens Wedd. Ann. Sci. Nat. III. Bot. **18**: 224. 1852.

Pilea dauciodora var. *uncidens* Wedd. in DC. Prodr. **16**[1]: 138. 1869.

Stem repent, at length suberect, reddish or purplish; stipules triangular, up to 1 mm long, soon deciduous; leaves broadly ovate, orbicular-ovate, or rarely ovate-lanceolate, averaging 1.5 cm long and 1 cm wide, obtuse or subacute at the apex, truncate, cordulate, or rarely subacute at the base, petiolate, crenate-serrate to base (teeth usually mucronulate, subimbricate), glabrous, dark green above, paler beneath, densely covered above with linear and fusiform cystoliths, those beneath fewer and fainter; plants monoecious or dioecious, the heads unisexual (both kinds often borne at same axil), rarely androgynous, slender-peduncled; staminate heads 2 to 6-flowered; pistillate inflorescence simple or decompound, consisting of 2 to 6 (rarely 1) globose, 8 to 20-flowered clusters; achenes oblong-ovate, 1 to 1.2 mm long, strongly flattened.

DISTRIBUTION: Guatemala; Colombia and Venezuela to Peru and Bolivia, at 2,000 to 3,200 meters altitude or rarely at lower elevations. Replaced in Ecuador by *P. jamesoniana,* a closely related species.

VENEZUELA.

FEDERAL DISTRICT: Caracas, *Pittier* 11120 (US).

ARAGUA: Colonia Tovar, *Fendler* 1246 (G, Gen, K, Mo); *Allart* 484 (US, Y).
MÉRIDA: Mucurubá, *Gehriger* 329 (Gen, US).

COLOMBIA.

SANTANDER: Las Vegas, *Killip & Smith* 16093 (G, US, Y). La Baja, *Killip & Smith* 18830 (G, US, Y).
NORTE DE SANTANDER: Río Mesme, between Pamplona and Toledo, *Killip & Smith* 19847 (G, US, Y). Loso, *Killip & Smith* 20390 (G, US, Y). Tapatá, *Killip & Smith* 20207 (G, US, Y). Páramo del Hatico, *Killip & Smith* 20669 (G, US, Y), 20693 (G, US, Y).
HUILA: Río Balsillas, *Rusby & Pennell* 794 (F, G, Mo, US, Y).
CUNDINAMARCA: Bogotá, *Holton* 262 (K, Ph, Y); *André* 1243 (K, Y). Páramo de Guasca, *Cuatrecasas* 2587 (US).
ANTIOQUIA: Medellín, *Archer* 1083 (US), 1084 (US); *Toro* 969 (Y), 1049 (Y).
CALDAS: Cerro Tatamá, *Pennell* 10379 (US).

PERU: "Andes," *Ruiz & Pavón* (Ma, P, type); *Spruce* (K).
HUÁNUCO: Muña, *Macbride* 4117 (F, US).
JUNÍN: Huacapistana, *Killip & Smith* 24160 (US), 24408 (US, Y). Acobamba, *Raimondi* 2800 (B).
AYACUCHO: Ccarrapa, *Killip & Smith* 22439 (F, US, Y).
PUNO: Sandía, *Weberbauer* 753 (B).

BOLIVIA: *Bang* 1787 (Mo), 1796 (B, BM, F, Mo, Y).
LA PAZ: Larecaja, *Weddell* 4561 (P, type of *P. uncidens*). Unduavi, *Rusby* 1483 (BM, G, Ph, Y); *Buchtien* 372 (US), 2813 (Y), 8937 (US). Sirupaya, *Buchtien* in 1906 (B). Sorata, *Mandon* 1103 in part (BM, P, V), 1124 (V).
COCHABAMBA: Incachaca, *Steinbach* 8974 (B), 9153 (B, Ph).
SANTA CRUZ: Santa Rosa, *Kuntze* in 1892 (K, Y).

This is a common plant of fairly wide range. By far the greater part of the specimens examined, from Central America and West Indies as well as from South America, have broadly ovate leaves and minute stipules, agreeing closest with the form described as *P. uncidens*.

55. Pilea fendleri Killip, Field Mus. Bot. **13**[2]: 341. 1937.

Urtica dichroa Poepp.; Wedd. in DC. Prodr. **16**[1]: 61. 1869, as synonym.
Pilea dauciodora var. *crenata* Wedd. in DC. Prodr. **16**[1]: 139. 1869. Not *P. crenata* Britton & Wilson.
Pilea dauciodora var. *pilosula* Wedd. in DC. Prodr. **16**[1]: 139. 1869.
Pilea leptophylla Killip, Contr. U. S. Nat. Herb. **26**: 387. 1936. Not *P. leptophylla* Urban, 1899.

Slender herb, with the stem repent at base, at length ascending and few- to several-branched, the branches up to 8 cm high; stipules triangular-ovate, 1 to 2 mm long, obtuse, subpersistent; leaves mainly rotund-spatulate (a few rhombic or suborbicular), 0.5 to 2 cm long, 0.5 to 1 cm wide (those of a node subequal and generally similar), obtuse or rounded at apex, cuneate at base, crenate or crenate-serrate above middle (teeth 3 to 5 to a side), triplinerved, very thin and lax, glabrous or sparsely pilosulous with hyaline hairs, conspicuously marked on upper surface with linear or fusiform cystoliths up to 0.8 mm long, the lower surface with numerous conspicuous cystoliths in longitudinal rows on the nerves, those elsewhere much fainter; plants monoecious, the heads unisexual or androgynous, borne in the axils of the upper leaves on slender peduncles 5 to 10 mm long; staminate flowers solitary, or 2 to 4, sessile in a few-branched cyme, or a few intermingled with the pistillate, the perianth about 2 mm wide when expanded, the lobes mucronulate; pistillate flowers sessile or subsessile, in small, usually densely-flowered cymes up to 5 mm wide, the perianth segments unequal, the middle segment about 0.5 mm long, the lateral half as long; achenes ovate, about 0.8 mm long.

DISTRIBUTION: Venezuela, Colombia, and Peru, up to 1,000 meters altitude.
VENEZUELA: *Gollmer* in 1854 (B).
ARAGUA: Colonia Tovar, *Fendler* 1247 (Bo, Brux, G, Gen, K, type, also type of *P. dauciodora* var. *crenata*, Ph, US); *Moritz* 790 (B, type of *P. dauciodora* var. *pilosula*, BM, Bo).
COLOMBIA.
MAGDALENA: Santa Marta Mountains, *H. H. Smith* 1223 (B, BM, Brux, F, G, Gen, P, Ph, US, Y).
PERU: *Poeppig* 1383 (B).
HUÁNUCO: Cochero, *Poeppig* 1552 in part (V).

This plant is distinguished from *P. dauciodora* by its thinner leaves, which are of a more definitely spatulate outline, with far more conspicuous cystoliths and with usually a few hyaline hairs, and by its persistent stipules.

In a list in the Prodromus of species excluded from *Urtica* Weddell gives *U. dichroa* Peopp., apparently only an herbarium name, as equaling *Pilea nummularifolia*, and it is so cited in Index Kewensis. Weddell did not, however, include it in the formal synonymy of *P. nummularifolia*, and the specimen in the Vienna herbarium bearing Poeppig's name is surely not that species. This specimen, as well as the one in the Berlin herbarium, agrees well with material of *P. fendleri* from northern South America, although this extension of range is rather remarkable.

Unfortunately the name *crenata* was not available in raising the variety to specific rank, and I was disinclined to use the varietal name *pilosula*, as that plant may prove to be specifically distinct. The confusion already existing would become worse, were Poeppig's manuscript name transferred to *Pilea*.

56. Pilea jamesoniana Wedd. Ann. Sci. Nat. III. Bot. **18**: 224. 1852.
Pilea dauciodora var. *jamesoniana* Wedd. in DC. Prodr. **16**[1]: 139. 1869.

Plant glabrous throughout; stem up to 25 cm long; stipules ovate, 4 to 5 mm long, persistent; leaves orbicular-ovate, 1 to 3.5 cm long, 1 to 2.5 cm wide, subacute at apex, truncate at base, crenate; plants monoecious, the cymes androgynous, the peduncles slender, 2 to 2.5 cm long; achenes ovate-oblong, 1.5 to 1.7 mm long.

DISTRIBUTION: Mountains of Ecuador, at about 3,000 meters altitude.
ECUADOR. "Andes, 3,000 meters," *Jameson* 745 (BM, Gen, K, type). "In Andibus," *Spruce* 6047 (K). *Sodiro* 153/23 (B).
PICHINCHA: *Sodiro* 153/23b (B). La Magdalena, *Firmin* 640 (F, US).
TUNGURAHUA: *Spruce* 6106 in part (V).

Pilea jamesoniana and *P. filipes* are distinguished from the common *P. dauciodora* by large persistent stipules. The leaves of both are usually larger and more pointed.

57. Pilea filipes Rusby, Bull. Torrey Club **28**: 311. 1901.

Plant glabrous throughout, the stem ascending, 20 to 40 cm high; stipules oblong, 5 to 7 mm long, persistent; leaves ovate-elliptic, 2 to 6 cm long, 1.5 to 3 cm wide, acute or acuminate at apex, acute or rounded at base, crenate-serrate; plants monoecious, the peduncles filiform, 4 to 6 cm long, the inflorescences unisexual, or rarely one or two staminate flowers at base of pistillate, in globose clusters forming a panicle; achenes less than 1 mm long.

DISTRIBUTION: Western Bolivia, at 1,800 to 2,600 meters altitude.
BOLIVIA.
LA PAZ: *Bang* 1788 (B, BM, G, Ph, US, V, Y). Yungas, 1,800 meters, *Rusby* 1756 (Y, type). Unduavi, *Rusby* 1479 (Y). Sorata, *Mandon* 1103 in part (Gen, P).

IX. Capitellatae

58. Pilea discolor Killip, Contr. U. S. Nat. Herb. **26**: 387. 1936.

Distribution: Known positively only from the Eastern Cordillera of Colombia.

Colombia: *Lehmann* BT1258 (K, type as to staminate inflorescence, Y).

Cundinamarca: Chinquinquirá, alt. 2,500 meters, *Ariste Joseph* A890 (Bog, US, type).

59. Pilea minutiflora Krause, Bot. Jahrb. Engler **37**: 529. 1906.

Plant glabrous throughout; stem erect, 30 to 40 cm high, few-branched; leaves ovate-lanceolate or ovate-elliptic, 3 to 8 cm long, 1.5 to 3 cm wide, acuminate at apex, rounded or cordulate at base, crenate-serrate to base, 3-nerved, the lateral nerves reaching only to upper third of blade; cystoliths few and very faint, linear; plants usually dioecious; staminate flowers in globose, few-flowered clusters about 4 mm in diameter, in a once-branched panicle, the perianth globose in bud, 2 mm in diameter, purplish distally, pale proximally, the lobes obtuse; pistillate flowers in small, subcontiguous clusters in subdichotomous cymes up to 7 cm long including a slender peduncle, the perianth scarcely 1 mm long; achenes about 1 mm long.

Distribution: Central and southern Peru, at 1,900 to 3,000 meters altitude.

Peru.

Junín: Huacapistana, 1,900 to 2,000 meters, *Weberbauer* 2027 (B, type).

Puno: Sandía, *Weberbauer* 575 (B).

The Indians are said to use this as a remedy for unrequited love.

60. Pilea capitellata Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 220. 1856–57.

Erect herb, 40 to 60 cm high, glabrous throughout, the internodes elongate; stipules cordate-ovate, subpersistent; leaves oblong, 8 to 15 cm long, 2 to 4 cm wide, acuminate at apex, acute or obtuse at base, serrate except at base, the cystoliths punctiform, obscure, more numerous beneath; plants dioecious; staminate heads globose, 5 to 8 mm in diameter, densely flowered, solitary, the peduncles filiform, 1 to 2 cm long.

Distribution: Known only from the type locality, in western Bolivia.

Bolivia.

La Paz: Tipuani, *Weddell* (P, type).

The type specimen is in poor condition, all of the leaves having become detached from the stem. Weddell evidently did not consider that the leaves of a node were dissimilar or greatly unequal. Were it possible to show that they were, there would be little to distinguish this species from *P. cymbifolia*, as the single-headed, globose staminate inflorescence and the large persistent stipules are common to the two. The foliage is very similar, although in *P. cymbifolia* the leaves are somewhat falcate.

61. Pilea cuprea Krause, Bot. Jahrb. Engler **37**: 530. 1906.

Pilea ornatifolia Killip, Journ. Washington Acad. Sci. **13**: 356. 1923.

Plant about 60 cm high, glabrous throughout; stem succulent, geniculate at middle of internodes; leaves ovate-lanceolate, acuminate at apex, serrate to base, cordulate, those of a pair similar but somewhat unequal, the larger 3.5 to 5.5 cm long, 1.5 to 2.5 cm wide, with petioles up to 1.5 cm long, the smaller 2.5 to 3.5 cm long, 1 to 1.5 cm wide, with petioles up to 3 mm; cystoliths on upper surface punctiform, on lower surface linear and fusiform, conspicuous; plants dioecious; staminate cluster solitary on slender peduncles or in a few-branched panicle, globose, about 6 mm in diameter; pistillate heads 4 to 8-flowered, sessile or short-peduncled.

Distribution: Known only from the northern part of the Western Cordillera of Colombia and the southern part of the Central Cordillera.

COLOMBIA.

ANTIOQUIA: *Triana* (HNC).

CALDAS: Cerro Tatamá, alt. 3,200 to 3,400 meters, *Pennell* 10476 (A, G, US, type of *P. ornatifolia*, Y).

EL CAUCA: Central Cordillera, near Popayán, alt. 2,200 to 2,700 meters, *Lehmann* 4475 (B, type, K, US).

62. Pilea tungurahuae Killip, Contr. U. S. Nat. Herb. **26**: 387. 1936.

DISTRIBUTION: Known only from the type locality, in the mountains of central Ecuador.

ECUADOR.

TUNGURAHUA: Eastern slope of Volcán Tungurahua, alt. 2,000 meters, *Tate* 585 (US, type).

63. Pilea rhombifolia Killip, Journ. Washington Acad. Sci. **13**: 357. 1923.

Plant 20 to 30 cm high, glabrous throughout; leaves rhombic-ovate, 2 to 4.5 cm long, 1.5 to 3 cm wide, cuneate or subrotund at base, crenate-serrate, subcoriaceous, dark green above, silvery white beneath, the cystoliths linear, conspicuous above; pistillate flowers in subsessile cymes up to 1 cm wide; achenes ovate, 1 mm long.

DISTRIBUTION: Known only from the type locality, in northeastern Colombia.

COLOMBIA.

MAGDALENA: Santa Marta, *H. H. Smith* 1446 (B, BM, F, G, Gen, K, Mo, Ph, US, type, Y).

64. Pilea pennellii Killip, Journ. Washington Acad. Sci. **13**: 357. 1923.

Plant herbaceous, about 30 cm high, branched near base, glabrous throughout, drying light green; leaves narrowly ovate-oblong, 2 to 4 cm long, 0.8 to 1.5 cm wide, acuminate at apex, tapering to base, minutely serrulate, above copiously covered with punctiform and minute linear cystoliths, beneath punctate with dark ocellae but nearly destitute of cystoliths; plants monoecious; staminate heads solitary, the peduncles filiform, about 3 cm long; pistillate cymes subsessile; achenes barely 0.5 mm long.

DISTRIBUTION: Known only from the type locality, in the northern part of the Western Cordillera of Colombia.

COLOMBIA.

CALDAS: Cerro Tatamá, alt. 2,400 meters, *Pennell* 10326 (US, type).

65. Pilea macbridei Killip, Journ. Washington Acad. Sci. **15**: 52. 1925.

Plant about 1 meter high, glabrous throughout, the stem woody, much branched above; leaves ovate or orbicular-ovate, 3 to 5 cm long, 1.5 to 2.5 cm wide, acuminate at apex, cordulate or subobtuse at base, serrate from base to apex; plants monoecious; staminate flowers in compact globose heads up to 6 mm wide, borne in the upper axils; pistillate flowers in small subsessile cymes in the lower axils; achenes punctulate.

DISTRIBUTION: Central Peru, at 2,800 to 3,000 meters altitude.

PERU.

HUÁNUCO: Río Chinchao, alt. 2,800 meters, *Macbride* 5179 (F, type, US).

JUNÍN: Carpapata, above Huacapistana, *Killip & Smith* 24457 (US, Y).

66. Pilea elegans Gay, Fl. Chil. **5**: 364. 1849.

Pilea elliptica var. *gayana* Wedd. in DC. Prodr. **16**[1]: 140. 1869.

Plant glabrous throughout; stem erect or ascending, 30 cm or more long, stout; leaves oblong-lanceolate or elliptic-lanceolate, 5 to 10 cm long, 2 to 3 cm wide, acuminate at apex, acute at base, crenate-serrate, 3-nerved, the nerves extending to apex of blade; cystoliths obscure, linear or fusiform above, punctiform beneath; plants monoecious; staminate flowers in a subglobose slender-peduncled head or in

glomerules forming a once-branched panicle; pistillate flowers in short-peduncled cymes; achenes broadly ovate, about 0.7 mm long.

DISTRIBUTION: Central Chile.

CHILE: Coronel, *Ochsenius* in 1862 (B).

ARAUCO: Cañete, *Claude Joseph* 5607 (US). La Mocha, *Philippi* (B); *Reed* in 1872 (BM).

CAUTÍN: Temuco, *Claude Joseph* 4658 (US).

VALDIVIA: Valdivia, *Gay* 236 (B, P, type, V); *Bridges* 742 (BM); *Buchtien* in 1902 (US).

Weddell reduced *P. elegans* Gay to a variety of *P. elliptica* and used the specific name *elegans* for a wholly distinct West Indian species. *Pilea elegans* Gay is quite different from *P. elliptica*.

Local name: "Mellahuvilu."

X. MULTIFLORAE

67. Pilea pteropodon Wedd. in DC. Prodr. 16[1]: 144. 1869.

Robust herb, glabrous throughout, the stem quadrangular, repent at the base, erect, unbranched, up to 25 cm high; stipules oblong or linear-oblong, 1.5 to 3 cm long, 3 to 8 mm wide, obtuse, persistent; leaves broadly ovate, ovate-oblong, elliptic, or rarely suborbicular, 12 to 25 cm long, 6 to 15 cm wide, abruptly acuminate or attenuate-acuminate, abruptly or subabruptly narrowed to a broadly winged petiole up to 10 cm long, triplinerved, crenate-serrate toward apex or subentire, the cystoliths filiform and punctiform, obscure on the under surface; plants dioecious; pistillate cymes dichotomous, up to 10 cm long including the peduncle and branches; achenes suborbicular, about 1 mm in diameter, apiculate.

DISTRIBUTION: Southwestern Colombia and northwestern Ecuador; subtropical zone, up to 1,500 meters altitude.

COLOMBIA.

EL CAUCA: La Gallera, Pacific slope, west of Popayán, *Killip* 7703 (G, US, Y). El Tambo, *Sneidern* 707 (S), 788 (S), 862 (S), 863 (S).

NARIÑO: Tuquerres, *Triana* (HNC, P, type), 892 (part of type?, B, BM, K, P). Armada, *André* 3510 (K).

ECUADOR.

ESMERALDAS: Playa Rica, Parroquia de Concepción, *Mexía* 8476 (US).

This species is readily recognized by the large, persistent stipules and the winged petioles. The shape of the blade, though fairly uniform in an individual plant, varies greatly in the different specimens cited above, ranging from elliptic (5:2) in the type to suborbicular (about 15 cm long and broad) in the Ecuador specimen.

LOCAL NAME: "Guaina."

68. Pilea carnulosa Wedd. Arch. Mus. Hist. Nat. (Paris) 9: 208. 1856–57.

Plant glabrous throughout, about 50 cm high, suberect or subscandent, the stem diffusely branched, drying straw-colored; stipules suborbicular, persistent; leaves narrowly lanceolate, 0.8 to 4 cm long, 0.5 to 1.5 cm wide, caudate-acuminate at apex, coarsely serrate, carnose; cystoliths of upper surface mainly punctiform, a few linear ones in longitudinal rows near margin and between nerves; plants dioecious; staminate flowers in small sessile glomerules in short-peduncled cymes; pistillate flowers in sessile, few-flowered cymes.

DISTRIBUTION: Eastern and Central Cordilleras of Colombia, at about 3,000 meters altitude.

COLOMBIA.

SANTANDER: La Baja, *Killip & Smith* 18808 (G, US, Y).

CUNDINAMARCA: Viotá, *André* K1679 (K).

TOLIMA: La Ceja, Old Quindío Trail, *André* K2215 (K, Y).

ANTIOQUIA: *Triana* 345 (P, type).

CALDAS: Magaña, Old Quindío Trail, *Killip & Hazen* 9438 (G, Ph, US, Y).

The texture of the stem and the persistent stipules suggest a relationship between this species and *P. flexuosa*, though there are several differences other than the dimorphic leaves of *P. flexuosa*.

69. Pilea smithii Killip, Contr. U. S. Nat. Herb. **26**: 388. 1936. PLATE 36.

DISTRIBUTION: Eastern Cordillera of Colombia, at 2,200 to 3,200 meters altitude; known only from the general vicinity of Bucaramanga.

COLOMBIA.

SANTANDER: La Baja, *Killip & Smith* 17188 (G, US, Y), 18284 (G, US, type, Y), 18797 (G, S, US, Y). California, *Killip & Smith* 16990 (G, US).

Two other specimens from the Department of Santander (*Killip & Smith* 16561 and 19021), both sterile, belong to an undescribed species of this relationship.

EXPLANATION OF PLATE 36.—*Pilea smithii*, the type specimen. One-half natural size.

70. Pilea marginata (Poepp.) Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 238. 1856–57.

Urtica marginata Poepp.; Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 238. 1856–57, as synonym.

Erect herb, 80 cm high or more, glabrous throughout; petioles 1 to 6 cm long; leaves oblong or oblanceolate, 10 to 20 cm long, 4 to 8 cm wide (lower slightly smaller), attenuate-acuminate, acute or subobtuse at base, undulate, sometimes minutely denticulate toward apex, coriaceous, the margin thickened, the cystoliths stellate, 3-rayed; plants apparently dioecious; staminate flowers in small subcontiguous glomerules in a narrow panicle, the perianth lobes subobtuse.

DISTRIBUTION: Northern and central Peru.

PERU: Río Amazonas, *Poeppig* D1088 (P, type, V), 2088 (BM).

SAN MARTÍN: Tarapoto, *Ule* 6508 (Go).

HUÁNUCO: Cochero, *Poeppig* 3045 (B, Gen, P, V). Pampayacu, alt. 1,100 meters, *Macbride* 5086 (F, K, US).

JUNÍN: San Nicolás, Pichis Trail, alt. 1,100 meters, *Killip & Smith* 26032 (F, US, Y).

This, the next following species, and *P. crugeriana* are characterized by stellate 3-rayed cystoliths on both surfaces of the leaves.

71. Pilea triradiata Killip, Contr. U. S. Nat. Herb. **26**: 389. 1936. PLATE 37.

DISTRIBUTION: Known only from the type specimen.

VENEZUELA.

FEDERAL DISTRICT: Caracas, *Gollmer* in 1856 (B, type).

EXPLANATION OF PLATE 37.—*Pilea triradiata*, the type specimen. One-half natural size.

72. Pilea rusbyi (Britton) Killip, Journ. Washington Acad. Sci. **15**: 293. 1925.

Urera rusbyi Britton, Bull. Torrey Club **28**: 310. 1901.

Erect or ascending herb, 30 cm or more high, glabrous throughout; leaves broadly ovate, suboblique, 10 to 20 cm long, 4.5 to 9 cm wide, abruptly caudate-acuminate at apex, subcuneate at base, finely serrate (serrations 5 per cm), the nervation beneath very dark, the petioles up to 6 cm long, those of a pair unequal; cystoliths punctiform and obscure above, almost wanting beneath; plants dioecious, the inflorescences cymose-paniculate, up to 20 cm wide, on peduncles 4 to 8 cm long; achenes 8 to 10 mm long.

DISTRIBUTION: Northwestern Bolivia, at 1,000 to 1,800 meters altitude.

BOLIVIA.

LA PAZ: Yungas, alt. 1,800 meters, *Rusby* 1774 (F, Y, type). Coroico, *Buchtien* 3754 (US, Y).

73. Pilea puracensis Killip, Journ. Washington Acad. Sci. **13**: 356. 1923.

Erect herb, 30 to 40 cm high, glabrous throughout; leaves elliptic or elliptic-lanceolate, 10 to 15 cm long, 3 to 6.5 cm wide, rounded or subauriculate at base, closely crenate-serrulate, the petioles unequal, 2.5 to 5 cm long; cystoliths punctiform and linear on both surfaces, faint; plants monoecious, the staminate inflorescence borne in the upper axils, the pistillate in the lower; staminate inflorescence subdichotomous, 3 to 6 cm long; pistillate inflorescence of paniculately branched, sessile cymes; achenes about 1 mm long, oblique.

DISTRIBUTION: Southern parts of the Central and Western Cordilleras of Colombia.

COLOMBIA.

EL CAUCA: Mount Puracé, alt. 3,200 meters, Central Cordillera, *Killip* 6673 (G, K, Ph, US, type, Y). El Tambo, alt. 2,800 meters, Western Cordillera, *Sneidern* 1210 (S).

74. Pilea antioquiensis Killip, Contr. U. S. Nat. Herb. **26**: 389. 1936. PLATE 38

DISTRIBUTION: Known only from the type locality, in northwestern Colombia.

COLOMBIA.

ANTIOQUIA: Angelopolis, *Toro* 885 (Y, type).

EXPLANATION OF PLATE 38.—*Pilea antioquiensis*, the type specimen. One-half natural size.

75. Pilea buchtienii Killip, Journ. Washington Acad. Sci. **15**: 297. 1925.

Succulent herb, glabrous throughout, the stem at first repent, at length erect, simple, about 20 cm high; leaves broadly ovate, borne near end of stem, 8 to 12 cm long, 3 to 6 cm wide, acute or caudate-acuminate at apex, tapering to a petiole 1 to 2.5 cm long, doubly crenate-serrate, carnose, the cystoliths of upper surface punctiform and fusiform, wanting beneath; plants monoecious, the staminate and pistillate flowers borne in separate few-branched panicles often at same node, the peduncles of both subequal, 1.5 to 2 cm long; achenes 1.5 mm long, strongly flattened.

DISTRIBUTION: Known only from the type locality, in central Bolivia.

BOLIVIA.

COCHABAMBA: Antahuacana, Espíritu Santo, alt. 750 meters, *Buchtien* 4526 (US, type).

76. Pilea verrucosa Killip, Journ. Washington Acad. Sci. **15**: 53. 1925.

Shrub, about 1 meter high, glabrous throughout, the stem few-branched, strongly verrucose-roughened; leaves ovate or subrhombic, 2 to 3.5 cm long, 1 to 2.5 cm wide, acute at apex, rounded or cordulate at base, crenate-serrate, entire at base, the petioles 3 to 8 mm long, the cystoliths punctiform; plants monoecious, the inflorescences unisexual; staminate flowers in much-branched, densely flowered panicles 2.5 to 4 cm long, in the upper axils, the perianth barely 0.5 mm long; pistillate flowers in subsessile cymes in the lower axils.

DISTRIBUTION: Known only from the type locality, in central Peru.

PERU.

HUÁNUCO: Río Chinchao, alt. 2,800 meters, *Macbride* 5201 (B, F, type, K, US).

77. Pilea apiculata Killip, Contr. U. S. Nat. Herb. **26**: 390. 1936.

DISTRIBUTION: Known only from northeastern Colombia.

COLOMBIA.

MAGDALENA: Río Piedras, near Santa Marta, *H. H. Smith* 1403 (distributed as *P. riparia;* B, BM, Brux, F, G, Gen, K, Mo, Ph, US, type, Y).

Another specimen of this species at the New York Botanical Garden bearing this same number was collected at "Cacagualito, 1,000 to 3,000 ft."

78. Pilea subamplexicaulis Killip, Contr. U. S. Nat. Herb. **26**: 390. 1936.

DISTRIBUTION: Known only from northern Peru, at 1,100 to 1,400 meters altitude.

PERU.

SAN MARTÍN: Cerro de Escaler, near Tarapoto, *Ule* 6588 (B, Gen, Go, type, K). San Roque, *L. Williams* 7425 (US).

79. Pilea punctata (H. B. K.) Wedd. Ann. Sci. Nat. III. Bot. **18**: 222. 1852.

Urtica punctata H. B. K. Nov. Gen. & Sp. **2**: 38. 1817.

Plant 20 to 40 cm high, glabrous throughout, the stem erect or ascending, strongly sulcate when dry; leaves ovate or ovate-elliptic, 3 to 8 cm long, 1.5 to 3 cm wide, caudate-acuminate, cuneate at base, coarsely crenate-serrate, triplinerved well above the base (lateral nerves extending barely to upper third of blade), slender-petioled, black-punctate beneath, the cystoliths fusiform, conspicuous above, very faint beneath; plants monoecious or dioecious, the clusters androgynous or unisexual, the staminate flowers short-pediceled, the lobes ovate, concave.

DISTRIBUTION: Northern Peru, at 1,300 to 1,600 meters altitude.

PERU: *Ruiz & Pavón* (Gen).

CAJAMARCA: Zaulaca, "Province of Jaen de Bracamoras," *Humboldt & Bonpland* (P, type).

AMAZONAS: Chachapoyas, *Weberbauer* 4307 (B, Gen).

80. Pilea attenuata Killip, Contr. U. S. Nat. Herb. **26**: 391. 1936. PLATE 39.

DISTRIBUTION: Known only from the type locality and its general vicinity.

ECUADOR.

PICHINCHA: Pilatón, *Sodiro* 153/24 (B, type). San Nicolás, alt. 900 meters, *Sodiro* 153/29 (B).

EXPLANATION OF PLATE 39.—*Pilea attenuata*, the type specimen. About one-half natural size.

81. Pilea mutisiana (Spreng.) Wedd. Ann. Sci. Nat. III. Bot. **18**: 218. 1852.

Urtica melastomoides H. B. K. Nov. Gen. & Sp. **2**: 38. 1817. Not *U. melastomoides* Poir. 1816, or *Pilea melastomoides* Wedd. 1854.

Urtica mutisiana Spreng. Syst. Veg. **3**: 840. 1826.

Pilea subserrata Wedd. Arch. Mus. Hist. Nat. (Paris) **9**: 207. 1856–57.

Pilea multiflora Wedd. in DC. Prodr. **16**[1]: 145. 1869, in part. Not *Urtica multiflora* Poir. 1816.

Coarse, erect, somewhat shrubby herb, simple or few-branched, up to 1 meter high, glabrous throughout; stipules less than 1 mm long, soon deciduous; petioles 5 to 15 mm (extremes up to 40 mm) long; leaves ovate, oblong, or elliptic, 5 to 12 cm long, 2 to 5 cm wide, acuminate or caudate-acuminate at apex, rounded or subacute at base, obscurely or prominently serrate above middle, the cystoliths linear, prominent and elevated above, obscure beneath, usually absent on the veins; plants monoecious or dioecious, the cymes unisexual; staminate inflorescence cymose-paniculate, up to 15 cm long, several times dichotomous, the flowers short-pediceled; pistillate flowers in sessile or subsessile cymes, shorter than the adjacent petiole; achenes orbicular-ovoid, about 1.5 mm long and 0.5 mm thick.

DISTRIBUTION: Eastern and Central Cordilleras of Colombia, at 2,000 to 3,200 meters altitude.

COLOMBIA.

CUNDINAMARCA: *Mutis* 1929 (B, type, Ma, US).

TOLIMA: Quindío, *Triana* 344 (HNC, P, type of *P. subserrata*); *Linden* 1206 (Brux); *Goudot* (P, V). Murillo, *Pennell* 3164 (US, Y), 3167 (G, US, Y). La Lora, Quindío Trail, *Killip* 9772 (G, US); *André* 879 (K, P). San Juan, *André* 2082 (K). Aguadita, *André* K1487 (K, P). La Suiza, *Cuatrecasas* 2589 (US).

ANTIOQUIA: *Jervise* (K).

CALDAS: Along Old Quindío Trail, *Killip & Hazen* 9475 (US), 9482 (G, Ph, US, Y), 11891 (G, Ph, US, Y). Salento, *Pennell* 8869 (G, US), 9299 (G, Ph, US, Y).

Weddell considered the Colombian plant (*Urtica melastomoides* H. B. K.) and the Peruvian one (*U. multiflora* Poir.) conspecific, using the specific name *Pilea mutisiana* in his first monograph and *P. multiflora* in the Prodromus. *Pilea multiflora* is clearly distinct from the Colombian plant, the points of difference being discussed in connection with that species.

The earliest specific name for the Colombian plant, *melastomoides*, is invalidated by its use for a species of *Pilea* from Java. Sprengel, perhaps aware of the earlier *Urtica melastomoides* of Poiret, substituted the name *Urtica mutisiana* for *U. melastomoides* H. B. K., and clearly *Pilea mutisiana* (Spreng.) Wedd. becomes the name for this species.

Pilea subserrata was based upon *Triana* 344 in the Paris herbarium. There are two sheets of this there. Both bear the name *Pilea mutisiana* in Weddell's handwriting, but neither is annotated *P. subserrata.* They represent typical *P. mutisiana.*

Pilea mutisiana grows in abundance along the Quindío Trail, some of the plants being almost true shrubs a meter high or more.

82. Pilea myriantha Killip, Contr. U. S. Nat. Herb. **26**: 391. 1936.

Urtica floribunda H. B. K. Nov. Gen. & Sp. **2**: 38. 1817. Not *Pilea floribunda* Baker, 1897.

Pilea mutisiana Wedd. Ann. Sci. Nat. III. Bot. **18**: 218. 1852, in part.

Pilea multiflora Wedd. in DC. Prodr. **16** [1]: 145. 1869, in part.

Erect suffrutescent herb, 50 to 60 cm high, glabrous throughout; stipules triangular, about 3 mm long, soon deciduous; petioles 3.5 to 4 cm long; leaves oblong or oblong-lanceolate, 7 to 12 cm long, 3 to 4.5 cm. wide, acuminate at apex, rounded at base, finely serrulate nearly to base, the cystoliths linear, conspicuous beneath; plants dioecious; staminate inflorescence paniculate, long-peduncled, much exceeding the petioles, profusely branched, the branches alternate, the flowers sessile in many-flowered clusters, the perianth broadly obovoid in bud, up to 1.2 mm in diameter.

DISTRIBUTION: Southwestern Colombia and northern Ecuador, at 2,000 to 2,500 meters altitude.

COLOMBIA.

EL CAUCA: Palacé, *Humboldt & Bonpland* (P, type). Coconuco, *Killip* 6832 (US, Y).

ECUADOR.

CARCHÍ: Near Pun, *Mexia* 7592 (US).

PICHINCHA: Mount Pichincha, *Sodiro* 153/27c (B).

This species, described as *Urtica floribunda* H. B. K., was merged with *P. mutisiana* by Weddell (*P. multiflora* in his last monographic treatment). The distinguishing characters noted by the original authors, i. e. longer petioles, a panicle with alternate, not dichotomous, branches, and smaller sessile flowers, hold good in the recently collected material, and seem of sufficient importance to justify

regarding the two species as distinct. In addition, the leaves are toothed nearly to the base in *P. myriantha*.

83. Pilea goudotiana Wedd. Ann. Sci. Nat. III. Bot. **18**: 216. 1852.

Succulent herb, glabrous throughout, the stem repent, the branches erect, up to 1.5 meters high; stipules oblong-lanceolate, 1.5 to 2 mm long, soon deciduous; leaves oblong or ovate-oblong, 5 to 9 cm long, 2 to 4.5 cm wide, abruptly acuminate at apex, rounded or cordulate at base, serrate except near base, thick, the upper surface papillose with very numerous punctiform cystoliths (hence scabrid) and bearing numerous linear and fusiform cystoliths, the lower surface with more obscure punctiform cystoliths; plants dioecious; staminate inflorescences paniculiform, borne in the upper axils, longer than the adjacent petioles; pistillate inflorescence cymose, the cymes shorter than the adjacent petioles, compact; achenes about 1 mm long.

DISTRIBUTION: Eastern Cordillera of Colombia, at 2,300 to 3,000 meters altitude.

COLOMBIA: *Humboldt & Bonpland* (B).

SANTANDER: Las Vegas, *Killip & Smith* 16097 (G, US, Y). Mount San Vicente, *Killip & Smith* 18964 (G, US, Y). Mount San Martín, *Killip & Smith* 19138 (G, US, Y), 19164 (G, US, Y), 19201 (G, US, Y). Mount Peña Blanca, *Killip & Smith* 19270 (G, US, Y).

CUNDINAMARCA: Bogotá (cultivated), *Goudot* (K, P, type). Fusagasugá, *André* K1682 (K). Tequendama Falls, *Troll* 3738 (B).

This species is easily confused with *P. mutisiana*, the principal points of difference being the larger stipules of *P. goudotiana*, the cystolithic marking, which results in a noticeable roughness to the upper surface of the leaves, the extension of the serrations nearly to the base of the leaves, and the smaller achenes.

84. Pilea losensis Killip, Contr. U. S. Nat. Herb. **26**: 391. 1936.

DISTRIBUTION: North-central Venezuela and northeastern part of the Eastern Cordillera of Colombia.

VENEZUELA.

ARAGUA: Rancho Grande, alt. 1,200 to 1,500 meters, *Pittier* 13984 (US).

COLOMBIA.

NORTE DE SANTANDER: Loso, north of Toledo, alt. 2,400 meters, *Killip & Smith* 20370 (G, US, type, Y). Between Pamplona and Toledo, *Killip & Smith* 19969 (G, US, Y).

85. Pilea suffruticosa Krause, Bot. Jahrb. Engler **37**: 529. 1906.

Plant erect, suffruticose, about 2 meters high, glabrous throughout, the stem simple, terete below, quadrangular above; leaves narrowly elliptic to ovate-elliptic, 5 to 8 cm long, 2 to 3 cm wide, acute at apex, subcuneate at base, serrulate, trinerved (lateral nerves reaching only to upper quarter of blade), epunctate beneath, thick-carnose, the cystoliths all fusiform, more than 0.5 mm long, borne mainly between the nerves on upper surface, obscure beneath; plants apparently dioecious; staminate inflorescences cymose-paniculate, much longer than the adjacent petiole, the perianth globose in bud, about 2 mm in diameter, the lobes linear, obtuse.

DISTRIBUTION: Known only from the type locality, in northern Peru.

PERU.

AMAZONAS: Chachapoyas, alt. 2,500 meters, *Weberbauer* 4387 (B, type).

86. Pilea citriodora Wedd. Ann. Sci. Nat. III. Bot. **18**: 216. 1852.

Urtica limoniodora Pavón; Wedd. Ann. Sci. Nat. III. Bot. **18**: 216. 1852, as synonym.

Pilea tarmensis Killip, Journ. Washington Acad. Sci. **15**: 51. 1925.

Erect herb, up to 60 cm high, glabrous throughout; stem simple; leaves ovate-lanceolate, 6 to 14 cm long, 2.5 to 6 cm wide, obtuse or short-acuminate at apex, cordulate, crenate-serrate from apex to base, bearing on both surfaces yellowish fusiform, linear, and punctiform cystoliths, the petioles up to 2 cm long, the lateral nerves extending to apex of blade; staminate flowers in dense clusters in diffuse long-peduncled panicles; pistillate inflorescence similar to the staminate, the segments unequal; achenes about 0.5 mm long.

DISTRIBUTION: Central Peru, at 1,700 to 2,400 meters altitude.

PERU: *Ruiz & Pavón* (B, Bo, P, type).

HUÁNUCO: Casapí, *Poeppig* 1260 (V).

JUNÍN: Huacapistana, Province of Tarma, *Macbride* 5822 (F, type of *P. tarmensis*, US); *Weberbauer* 1776a (B). Chanchamayo, *Raimondi* 2398 (B).

87. Pilea poeppigiana Wedd. Ann. Sci. Nat. III. Bot. **18**: 225. 1852.

Plant herbaceous, glabrous throughout; stem repent, at length erect, 30 to 50 cm high, unbranched; stipules broadly ovate, 1 to 2 mm long, subpersistent; leaves ovate-lanceolate or oblong-lanceolate, rarely oblanceolate, 3.5 to 10 cm long, 2 to 5 cm wide (extremes to 15 cm long and 7 cm wide), acuminate, cuneate at base, serrulate or crenate-serrate nearly to base, triplinerved, the petioles up to 7 cm long, the cystoliths fusiform or filiform, with a few punctform ones intermingled; plants dioecious; pistillate inflorescences cymose-paniculate, borne in the upper axils, the peduncles slender, up to 4.5 cm long, longer than the adjacent petioles; achenes ovate-oblong, about 0.8 mm long.

DISTRIBUTION: Eastern slopes of the northern part of the Peruvian Andes, up to 2,000 meters altitude.

PERU.

SAN MARTÍN: Tarapoto, *Ule* 6844 (B, Gen, Go).

HUÁNUCO: Cochero, *Poeppig* 1032 in part (V), 1539B (P,[5] type, V). Yanano, *Macbride* 3770 (F, US).

JUNÍN: Dos de Mayo, Pichis Trail, *Killip & Smith* 25826 (F, US, Y). Porvenir, *Killip & Smith* 25902 (US, Y).

In the key (p. 375) and in the Flora of Peru I differentiated this species from *P. multiflora* on the basis of its larger stipules, having considered Klug's 1672, from southeastern Colombia, as belonging to *P. poeppigiana*. I have since had an opportunity of examining more carefully the type of *P. poeppigiana*, and find that the stipules, though subpersistent, actually are only 1 to 2 mm long. This, together with other differences, has led me to describe the Klug plant as new.

This revised interpretation of *P. poeppigiana*, together with other changes, makes necessary the following alteration to the latter part of the key to the species of Capitellatae (p. 375):

Achenes very small, less than 1 mm long (Peru).
  Leaves obtuse or short-acuminate at apex, cordulate at base—**86. P. citriodora.**
  Leaves long-acuminate at apex, cuneate at base—**87. P. poeppigiana.**
Achenes larger, 1 to 1.5 mm long.
  Stipules lanceolate, 8 to 10 mm long, persistent (Colombia)—**87a. P. umbriana.**
  Stipules triangular, not more than 1 mm long, soon deciduous.
    Leaves oblong-lanceolate to ovate-lanceolate, the petioles (at least the longer at a node) more than 1 cm long, the teeth subequal (Peru and Bolivia). **88. P. multiflora.**
    Leaves narrowly lanceolate, sessile or subsessile, the teeth larger toward apex (Bolivia)—**89. P. picta.**

[5] The type is unnumbered and is labeled merely "Peruvia subandina." However, it is clearly a part of no. 1539B.

87a. Pilea umbriana Killip, sp. nov.

Herba dioica, glaberrima; stipulae magnae, lanceolatae, persistentes; folia jugi similia et subaequalia, rhombeo-lanceolata vel oblanceolata, acuminata, petiolata, serrata, cystolithis filiformibus, supra ad marginem fusiformibus, subtus paucis; cymae ♀ pedunculatae, pauciramosae, floribus pedicellatis.

Plant herbaceous, glabrous throughout; stem repent at base, at length erect, about 15 cm high, unbranched; stipules lanceolate, 8 to 10 mm long, 3 to 4 mm wide, obtuse, persistent; leaves of a pair similar and subequal, rhombic-lanceolate or slightly oblanceolate, 8 to 12 cm long, 2.5 to 4 cm wide, acuminate at apex, subcuneate at base, petiolate (petioles 1 to 1.5 cm long), serrate except in the lower part, subtriplinerved (lateral nerves extending to upper third of blade), the upper surface bearing numerous conspicuous, filiform cystoliths and, at the margin, larger fusiform ones, the under surface sparingly black-punctate, bearing a few faint filiform cystoliths; plants dioecious; pistillate cymes about 1.5 cm long including a slender peduncle, few-branched, the flowers pediceled, the perianth segments unequal, the achenes compressed, about 1 mm long.

Type in the U. S. National Herbarium, no. 1,456,455, collected in forest at Umbría, Comisaría del Putumayo, Colombia, altitude about 325 meters, October 22, 1930, by Guillermo Klug (no. 1672).

This species rather closely resembles *P. poeppigiana*, under which name duplicates of the type have been widely distributed. It differs from that, however, in the much larger, persistent stipules, the relatively few and inconspicuous cystoliths on the under surface of the leaves, and the larger achenes.

88. Pilea multiflora (Poir.) Wedd. Ann. Sci. Nat. III. Bot. **18**: 218. 1852, in part.

Urtica multiflora Poir. in Lam. Encycl. Suppl. **4**: 223. 1816.

Pilea anomala Wedd. Ann. Sci. Nat. III. Bot. **18**: 217. 1852.

Erect herb, up to 1 meter high, glabrous throughout, the stem simple or few-branched; stipules triangular, not more than 1 mm long, soon deciduous; petioles 1 to 3 cm long; leaves oblong-lanceolate to ovate-lanceolate, rarely oblanceolate, suboblique, 4 to 15 cm long, 1.5 to 4 cm wide, long-acuminate at apex, rounded or subacute at base, sharply serrulate, trinerved, the cystoliths linear and punctiform, faint; plants monoecious or dioecious, the inflorescences unisexual, both kinds cymose-paniculate, diffuse; achenes ovate, 1 to 1.5 mm long, compressed, longitudinally elevated at center, slightly thickened at margin.

Distribution: Central Peru to central Bolivia, at 600 to 2,200 meters altitude.

Peru: *Jussieu* (P, type); *Dombey* (P).

Huánuco: Pampayacu, *Weberbauer* 6812 (B).

Junín: Along Pichis Trail, *Killip & Smith* 25775 (F, US, Y), 25801 (US, Y), 25913 (US), 25929 (US, Y).

Puno: Sandía, *Weberbauer* 6521 (B).

Cuzco: Cerro de Cusilluyoc, *Pennell* 14013 (Ph).

Bolivia: Lambramani, *Cárdenas* 1316 (Y).

La Paz: Province of Inquisivi, *Weddell* 4184 (P, type of *P. anomala*). Yungas, *Rusby* 1478 (US, Y). Sorata, *Mandon* 1104 (BM, Gen, K, P, V). Songo, *Bang* 894 (B, BM, F, G, K, Ph, US, V, Y). Tipuani Valley, *Buchtien* 7262 (B, US), 7263 (B, US). Mapiri Region, *Buchtien* 657 (B, US). Unduavi, *Bang* 2490 (K, US, Y).

Santa Cruz: San Mateo, *Steinbach* 8542 (B).

Cochabamba: Incachaca, *Steinbach* 5709 (B, F), 5812 (B). Chimoré, *Cárdenas* 2074 (G).

This species has been confused with *P. mutisiana*, to which it bears a general resemblance. The pistillate inflorescence is diffuse, and the achenes are strongly flattened and thickened at the margin and have a longitudinal ridge at the center.

I have made direct comparison between the types of *P. anomala* and *P. multiflora* and can see no important differences.

89. Pilea picta Herzog, Med. Rijks Herb. Leiden no. 27, 76. 1916.

Pilea macrophylla Rusby, Descr. S. Amer. Pl. 10. 1920.

Plant herbaceous, glabrous throughout, the stem repent, at length erect, 20 to 30 cm high; stipules not more than 1 mm long, soon deciduous; leaves narrowly lanceolate or elliptic-lanceolate, 6 to 15 cm long, 1 to 4 cm wide, caudate-acuminate, narrowed at base, sessile or subsessile, trinerved, sharply serrate or serrulate to base, the teeth larger toward the apex, the cystoliths minute, filiform and subpunctiform, inconspicuous beneath; plants dioecious, rarely monoecious; staminate inflorescence diffusely cymose, up to 12 cm wide, long-peduncled, the perianth about 1.5 mm wide, purplish; pistillate cymes barely 1 cm long (including peduncle), few-branched, the perianth segments subequal; achenes ovate, about 2 mm long, longitudinally ridged at center.

DISTRIBUTION: Western Bolivia, up to 3,300 meters altitude.

BOLIVIA: *Bang* (Y, type of *P. macrophylla*). Choquetanga Grande, alt. 3,300 meters, *Herzog* 2416 (Gen, type collection).

LA PAZ: Unduavi, *Buchtien* 3110 (K, US, Y), 4524 (US), 8940 (US), without number (G); *Julio* 332 (US), 357 (US), 466 (US).

XI. MOLLES

90. Pilea mollis Wedd. Arch. Mus. Hist. Nat. (Paris) 9: 251. 1856–57.

Pilea succulenta Wedd. Arch. Mus. Hist. Nat. (Paris) 9: 256. 1856–57. Not *P. succulenta* Hook. f. 1847.

Erect herb, 30 to 40 cm high, simple or few-branched, pilosulous above; leaves oblong to elliptic-lanceolate, 6 to 15 cm long, 2.5 to 5.5 cm wide, acuminate at apex, rounded or acutish at base, sharply but often shallowly serrulate, at least in upper half, glabrous above, softly pilosulous on nerves and veins beneath; cystoliths linear and fusiform, less conspicuous beneath; plants monoecious or dioecious; staminate flowers in globose umbels about 1.5 cm in diameter, the peduncles 3 to 8 cm long, the pedicels 3 to 4 mm long, slender, densely cano-pilosulous, the perianth lobed to middle, the lobes ovate; pistillate inflorescence cymose-paniculate, pedunculate, diffuse; achenes ovate, scarcely 1 mm long.

DISTRIBUTION: Northern Venezuela.

VENEZUELA.

FEDERAL DISTRICT: Caracas, *Pittier* 9585 (G, US, Y); *Kuntze* 1670 (K, US, Y); *Funck* 145 (Gen, P, type of *P. succulenta* Wedd.). Cerro de Galipán, *Eggers* 13178 (US). Caripe, *Moritz* (B). Sanchorquiz, *Ernst* 1705 (BM).

ARAGUA: Colonia Tovar, *Moritz* 366 (B, BM, type, K); *Fendler* 1241 (A, G, Gen, K).

Readily recognized by its large globose staminate heads and the dense indument on the under surface of the leaves.

Pilea succulenta Wedd. apparently is a form of this, with thicker, coarsely serrate leaves, the nerves and veins of which are deeply impressed above. The type specimen of *P. mollis* is a pistillate plant, the single flowering branch of which is a detached long-peduncled cyme well past maturity. The shape of the leaves of this is almost identical with that of the Kuntze specimen cited above, though the nerves in the latter are not conspicuously impressed. Only a single staminate head is present on the Kuntze specimen, but that is identical with typical material of *P. mollis*.

91. Pilea forgeti N. E. Brown, Bot. Mag. Curtis **143**: *pl. 8699.* 1917.

Low herb, 10 to 15 cm high; stem branched at the base, appressed-pilose; stipules ovate-lanceolate, 1 to 2 cm long, 5 to 6 mm wide, persistent; leaves oblanceolate or elliptic-lanceolate, 2 to 10 cm long, 2 to 5 cm wide, abruptly acute or subobtuse at apex, subauricular at base, crenate-serrate, trinerved (nerves extending to apex of blade), the petioles up to 1.5 cm long, the cystoliths inconspicuous, the upper surface of the blade glabrous, reddish brown, green along the nerves, the under surface appressed-pubescent on the nerves, purple, with green nerves and veins; plants dioecious; staminate flowers short-pedicellate, in a large compact, or at length somewhat diffuse, dichotomous cyme, the peduncle 5 to 6 cm long; pistillate flowers in small, sessile or subsessile cymes.

Distribution: Venezuela; apparently also in Panama.

Venezuela: *Forget* (K, type).

92. Pilea pittieri Killip, Journ. Washington Acad. Sci. **15**: 298. 1925.

Plant herbaceous, decumbent or erect, up to 40 cm high, the stem simple or few-branched, glabrescent below, sparingly pubescent above, densely marked throughout with linear cystoliths; stipules linear-oblong, 5 to 6 mm long, deciduous; leaves ovate or ovate-lanceolate, 3 to 10 cm long, 1.5 to 7 cm wide, long-acuminate at apex, rounded or subcordate at base, 3- (or occasionally 5) nerved (inner lateral nerves three-fourths length of blade), reticulate, serrate or serrate-crenate nearly to base, the upper surface dark green, glabrous, bearing numerous minute linear cystoliths, especially along the nerves, the under surface paler, densely pubescent on nerves and veins, punctate on veins, bearing similar but less numerous cystoliths; plant monoecious; staminate cymes solitary in the axils of the lower leaves or at the leafless nodes of the rooting portion of the stem, subsessile (or on peduncles up to 3 cm long), pubescent, densely flowered; pistillate inflorescence solitary in the axils of the upper leaves, 4 to 5 cm long, the peduncles slender, glabrous, 2 to 4-forked, the flowers borne in subglobose clusters 3 to 4 mm wide; achenes ovate, 1 mm long, acute, flattened, unicostate at center of both faces.

Distribution: Costa Rica and northern Colombia, the type collected in Costa Rica by H. Pittier (Herb. Inst. Phys. Geog. Costaricensis 14149).

Colombia.

Bolívar: Antizales, alt. 1,700 to 2,000 meters, *Pennell* 4416 (Y).

93. Pilea tatamensis Killip, Journ. Washington Acad. Sci. **13**: 358. 1923.

Stem repent, at length erect, coarse, up to 35 cm high, simple or branched toward summit, hirsute throughout; leaves ovate or elliptic-ovate, 2 to 6 cm long, sharply serrate nearly to base, glabrescent above, appressed-hirsute on nerves beneath, 3-nerved, the lateral nerves reaching about to middle of blade, the cystoliths linear, minute, faint; staminate heads globose, about 1 cm wide, densely flowered, the peduncles up to 1.5 cm long, the perianth lobes filiform, about 2 mm long; pistillate heads cymose, up to 1.5 cm wide; achenes ovate, 1 mm long.

Distribution: Northern parts of Central and Western Cordilleras of Colombia, at 2,500 to 2,700 meters altitude.

Colombia.

Antioquia: Medellín, *Toro* 949 (Y).

Caldas: Cerro Tatamá, alt. 2,700 meters, *Pennell* 10325 (G, US), 10378 (US, type).

This species has a general resemblance to *P. fallax*, but is at once distinguished by the 3-nerved leaves.

94. Pilea submissa Wedd. in DC. Prodr. **16**[1]: 151. 1869.

Plant terrestrial or repent on tree trunks, the erect or ascending portion of the stem less than 10 cm long, pubescent; leaves rhombic-elliptic, 4 to 9 cm long, 1.5

to 3.5 cm wide (extremes up to 15 cm long and 7 cm wide), acuminate at the apex, acute at the base, short-petioled, crenate-serrulate, glabrous above, hispidulous on the nerves and principal veins beneath, the cystoliths minute, fusiform, very numerous; plants monoecious or dioecious, the cymes unisexual; staminate flowers in compact or at length subdivaricate cymes with slender peduncles 4 to 8 cm long, borne at the rooting, leafless nodes, the lobes ovate, 2 mm long, including a tip 0.8 to 1 mm long; pistillate cymes borne at the upper axils, similar to the staminate, the peduncles slender, 2.5 to 3 cm long; achenes about 2 mm long, flattened.

DISTRIBUTION: Amazon basin of Ecuador and Peru, at low elevations.

ECUADOR.

NAPO-PASTAZA: Archidona, *Mexía* 7307 (US).

PERU.

SAN MARTÍN: Tarapoto, *Spruce* 4155 (K, type).

LORETO: Pongo de Manseriche, *Mexía* 6359 (US). Pumuyacu, *Klug* 3186 (US).

JUNÍN: San Nicolás, Pichis Trail, alt. 1,100 meters, *Killip & Smith* 26023 (US, Y).

95. Pilea latifolia Wedd. Arch. Mus. Hist. Nat. (Paris) 9: 249. 1856–57.

Plant suffrutescent, the branches cano-pilosulous above; leaves broadly ovate or elliptic-obovate, 6 to 12 cm long, 5 to 8 cm wide, short-acuminate at apex, rounded or cordulate at base, irregularly and doubly crenate-serrate, triplinerved or quintuplinerved, glabrous above, pilosulous on the nerves beneath, the cystoliths linear; plants dioecious; staminate inflorescence compactly and narrowly paniculate, the peduncle more than twice as long as the adjacent petiole, the perianth segments with subulate tips; pistillate flowers in smaller cymes, with shorter peduncles.

DISTRIBUTION: Eastern Cordillera of Colombia, at 2,000 to 2,300 meters altitude; also in Venezuela.

VENEZUELA: *Crüger* (K).

COLOMBIA.

NORTE DE SANTANDER: Ocaña, *Schlim* 701 (Bo, Gen, HNC, K, P, type).

SANTANDER: *André* 1053 (Y). Suratá, *Killip & Smith* 16560 (G, US, Y). Charta, *Killip & Smith* 19032 (US).

96. Pilea gallowayana Killip, Contr. U. S. Nat. Herb. **26**: 392. 1936.

Pilea grandis var.? *triplinervia* Wedd. in DC. Prodr. **16**[1]: 143. 1869.

Plant herbaceous, the stem repent at base, at length erect, 20 to 35 cm high, leafy, at least toward the apex, glabrescent below, glabrescent or usually rufo-hirsute above the middle; stipules broadly ovate-lanceolate, 9 to 10 mm long, obtuse, glabrous, persistent; leaves rhombic-ovate or ovate-elliptic, 3 to 12 cm long, 2 to 7 cm wide, acute or acuminate at apex, rounded or emarginate at base (petioles up to 1.5 cm long), unequally and often doubly crenate-serrate, triplinerved or quintuplinerved, the lateral nerves extending to the upper third of the blade, the upper surface glabrous, or sparingly pilosulous with hyaline hairs, and copiously covered with fusiform and punctiform cystoliths, the under surface hirsute on the nerves, sparingly pilosulous elsewhere, bearing numerous punctiform and a few linear cystoliths; plants dioecious, the staminate and the pistillate inflorescences each in compact cymes up to 1.5 cm wide, similar in shape, the peduncles slender, up to 2 cm long, often hirtellous; staminate perianth glabrous or pilosulous, densely covered with fusiform cystoliths without; pistillate perianth with unequal segments; achenes broadly ovate, 1 to 1.2 mm long.

DISTRIBUTION: Western Cordillera of Colombia, up to 2,000 meters altitude.
COLOMBIA: "Prov. de Barbacoas y Chocó, alt. 200 m.," *Triana 891* (B, HNC, K, type of *P. grandis* var.? *triplinervia*).

EL CHOCÓ: Between La Oveja and Quibdó, *Archer* 1701 (US). Headwaters of the Río Tutunendo, east of Quibdó, *Archer* 2184 (US), 2189 (US).

EL VALLE: La Cumbre, alt. 2,000 meters, *Pennell & Killip* 5878 (G, US, type, Ph, Y). Mountains west of Buenaventura, *Lehmann* in 1878 (V).

EL CAUCA: El Tambo, *Sneidern* 413 (S), 773 (S), 975 (S), 993 (S).

NARIÑO: Tuquerres, alt. 150 meters, *Triana* in 1853 (HNC). Armada, *André* K1680 (K).

Pilea grandis var. *triplinervia*, type material of which I have seen since describing *P. gallowayana*, seems to be only a more robust form of this. In the recent Sneidern specimens the indument on the stem is much denser than in the typical form. In view of this additional material an amplified description of the species is given.

XII. PUBESCENTES

97. Pilea nummularifolia (Swartz) Wedd. Ann. Sci. Nat. III. Bot. **18**: 255. 1852.

Urtica nummularifolia Swartz, Svensk. Vet. Akad. **8**: 63. *pl. 1, f. 2.* 1787.

Stem slender, villosulous, repent or trailing, rooting at most of the nodes, with short, lax branches sometimes arising at the nodes; stipules broadly ovate, 2 to 3 mm long, membranous, persistent; leaves orbicular, 5 to 12 mm in diameter, crenate, trinerved, usually strigillose with stiff, hyaline hairs on both surfaces, the cystoliths minute, linear, very faint on the under surface; plants dioecious or occasionally monoecious, a few pistillate flowers being borne at the base of the staminate; staminate flowers densely clustered in the uppermost axils, with densely white-villous pedicels 3 to 5 mm long; pistillate flowers in densely flowered, short-peduncled cymes; achenes barely 0.4 mm long.

DISTRIBUTION: West Indies, Panama, Venezuela, and Amazonian Peru, at low elevations; introduced into eastern Brazil.

VENEZUELA.

FEDERAL DISTRICT: Caracas, *Rose* 21946 (US); *Pittier* 7145 (US).

PERU.

LORETO: Pebas, on Río Amazon, *L. Williams* 1917 (F, US).

The indument of these specimens is rather denser than in most West Indian material of *P. nummularifolia*. The only one in flower, *Pittier 7145*, a staminate plant, has long-pediceled flowers in a cluster at one of the upper nodes of a short branch, this inflorescence agreeing well with the few staminate specimens from the West Indies at hand. Klug has collected abundant material of a plant which, at first glance, bears only slight resemblance to the quite uniform specimens of *P. nummularifolia*. In most of the Klug plants the lower portion of the stem is repent and leafless, and the upper part is erect, with leaves densely massed near the apex, its habit thus being that of *P. involucrata*, *P. spruceana*, and their allies. These leaves are much larger than in typical *P. nummularifolia*, attaining a maximum length and width of 3.5 cm, and averaging about 3 cm long and 2.5 cm wide. Many of them are broadly ovate, rather than strictly orbicular. The staminate inflorescence, the only one seen, is long-peduncled, though otherwise it is characteristic of *P. nummularifolia*. Some of these plants, however, have sterile branches rooting at all the nodes and bearing small orbicular leaves, apparently differing in no way from those of *P. nummularifolia*. This collection may represent a distinct species, but I prefer for the present to treat it as a variety.

Pilea nummularifolia var. klugii Killip, var. nov.

Caulis basi repens, demum erectus, ramis sterilibus nodis omnibus radicantibus; folia orbiculata vel late ovata, ea ramorum sterilium minora; inflorescentia ♂ pedunculata.

Plant densely hirsute throughout; stem repent at base, at length erect, 4 to 5 cm high, simple or with a few sterile repent branches rooting at all the nodes; leaves of the fertile part densely massed toward the apex, orbicular or broadly ovate, 1.5 to 3.5 cm long and broad, those of the sterile shoots orbicular, up to 1 cm long and broad; staminate inflorescence borne in the upper axils, peduncled, the peduncle slender, 1.5 to 2 cm long.

Type in the U. S. National Herbarium, no. 1,458,571, collected on river bank, Juan Jui, Alto Río Huallaga, Department of San Martín, Peru, altitude 400 to 800 meters, January 1936, by Guillermo Klug (no. 4235).

98. Pilea acuminata Liebm. Dansk. Vid. Selsk. Skrivt. V. **2**: 302. 1851.

Plant herbaceous, 15 to 40 cm high; petioles up to 4 cm long; leaves ovate, elliptic-ovate, or elliptic-lanceolate, up to 15 cm long, 7 cm wide, acute or acuminate at apex, rounded or subcuneate at base, coarsely and sharply dentate, sparsely strigillose with long hyaline hairs above, appressed-hirsute or hirsutulous on the nerves beneath; plants dioecious or monoecious, the cymes diffusely branched, with peduncles 3 to 6 cm long, unisexual or sometimes a sessile cluster of staminate flowers borne on the pistillate cymes; staminate perianth elongate, with filiform teeth; achenes minute.

Distribution: Mexico and Costa Rica; Colombia, at 1,000 to 1,500 meters altitude, the type from Mirador, State of Veracruz, Mexico, collected by F. M. Liebmann.

Colombia.

Santander: El Roble, *Killip & Smith* 19370 (G, US, Y).

Norte de Santander: Between Ocaña and Pamplona, *Kalbreyer* 1039 (B, K).

Boyacá: Labranzgrande, *Guevara* 344 (US).

Cundinamarca: Upín, *André* K1677 (K). Susumuco, *André* K1678 (K).

El Cauca: La Gallera, Micay Valley, *Killip* 7672 (B, G, Ph, US, Y).

99. Pilea involucrata (Sims) Urban, Symb. Antill. **1**: 298. 1899.

Urtica involucrata Sims, Bot. Mag. Curtis **51**: *pl. 248 1.*1824.

Pilea chrysosplenioides Wedd. Ann. Sci. Nat. III. Bot. **18**: 231. 1852.

Pilea pubescens var. *involucrata* Wedd. in DC. Prodr. **16**[1]: 153. 1869.

Stem and branches usually hirsute, densely covered with linear cystoliths; leaves ovate to obovate, or the lower often suborbicular, 0.8 to 4 cm long, 0.8 to 2 cm wide, rounded at apex, rounded or subauriculate at base, finely crenate, ciliate, strigillose with hyaline hairs, or rarely glabrous above, the cystoliths linear or fusiform, covering the lower surface, usually confined to margin on upper surface; plants monoecious or dioecious, the cymes unisexual, occasionally androgynous, sessile or subsessile, the staminate few-flowered, at base of branched, many-flowered pistillate cymes; achenes minute, less than 0.5 mm long.

Distribution: Panama and West Indies to Colombia and Venezuela, up to 1,500 meters altitude.

Venezuela.

Sucre: Cristóbal Colón, *Broadway* 42 (US, Y), 646 (US, Y).

Federal District: Caracas, *Bailey & Bailey* 906 (US); *Pittier* 12417 (US).

Aragua: Between Ocumare and Maracay, *Pittier* 11863 (K, US). Colonia Tovar, *Fendler* 1244 (Brux, G, Gen, K, Mo).

Colombia: *Mutis* 1922 (Ma). Río Simanche *André* 4674 (K). Palanda, *André* K1666 (K).

MAGDALENA: Santa Marta, *H. H. Smith* 1445 (F, K, US, Y).
NORTE DE SANTANDER: Chinácota, *Killip & Smith* 20800 (US).
CUNDINAMARCA: Fusagasugá, *Goudot* (P, type of *P. chrysosplenioides*); *Pennell* 2731 (F, G, Mo, US, Y). Bogotá, *Stübel* 90e (B). Albán, *Pérez* 2374 (US).
PUTUMAYO: Sibundoy, *García* 4578 (US).
TOLIMA: La Plata, *Lehmann* K333 (K).
ANTIOQUIA: Medellín, *Toro* 624 (Y).
EL VALLE: Zarzal, *Pennell, Killip, & Hazen* 11887 (US). La Cumbre, cultivated, *Killip* 5845 (US). La Paila, *Holton* 256 (K, Ph).

Weddell treated *Urtica involucrata*, the earliest name of this group of *Pilea*, as a variety of *P. pubescens*, but, as pointed out by Urban, it can scarcely be associated with that species. The original description of *Urtica involucrata* is unsatisfactory, but the illustration closely resembles the plant that has generally passed as *P. chrysosplenioides*.

100. Pilea ceratocalyx Wedd. in DC. Prodr. **16**[1]: 148. 1869.

Plant densely grayish hirsute throughout; stem repent at base, at length erect, up to 15 cm high; stipules ovate or subreniform, about 6 mm long; leaves oblong or elliptic-ovate, 3 to 7 cm long, 1 to 3 cm wide, acuminate at apex, attenuate at base, sharply serrate except toward base, the cystoliths punctiform and fusiform; plants monoecious, the cymes apparently unisexual, the staminate compact, subsessile, about as long as the adjacent petioles, the pistillate divaricate, pedunculate, much longer than the petioles; achenes about 0.6 mm long.

DISTRIBUTION: Probably northern Peru.

PERU: *Poeppig* 3046 (B, Bo, Gen, type).
HUÁNUCO: Cochero, *Poeppig* 1032 in part (BM, V).

These specimens are variously labeled "Peru" and "Brazil" in herbaria.

101. Pilea spruceana Wedd. in DC. Prodr. **16**[1]: 161. 1869.

Stem repent, at length erect, sparsely villous; leaves oblong or ovate-oblong, 2 to 8 cm long, 1.5 to 4 cm wide (the lower smaller), obtuse or subacute at apex and base, crenate-serrate, sparingly ciliate, the petioles 0.5 to 3.5 cm long, the cystoliths punctiform and fusiform, the fusiform more numerous at margin, yellowish, much elevated; plants monoecious or dioecious, the pistillate flowers in densely flowered, short-peduncled, usually much-branched cymes, the staminate flowers subsessile at base of pistillate cymes; achenes about 0.5 mm long.

DISTRIBUTION: Subandean part of northern Peru and northwestern Bolivia.

PERU.
SAN MARTÍN: Tarapoto, *Spruce* 4376 (B, BM, Brux, Gen, K, type, V, Y).
LORETO: Cumbaso, *Ule* 6843 (B, Gen).
HUÁNUCO: Posuso, *Pearce* 284 (BM).

BOLIVIA.
LA PAZ: Río Cocos, *R. S. Williams* 199 (BM, US, Y).

102. Pilea pubescens Liebm. Dansk. Vid. Selsk. Skrivt. V. **2**: 302. 1851.
Pilea montana Wedd. Ann. Sci. Nat. III. Bot. **18**: 228. 1852.
Pilea pubescens var. *montana* Wedd. in DC. Prodr. **16**[1]: 153. 1869.

Stem repent, at length erect and usually with several erect or ascending branches, strigillose; leaves massed at the end of the stem or branches, wanting or much reduced below, broadly ovate to elliptic-ovate, up to 7 cm long and 6 cm wide, rounded or subacute at apex, rounded at base, finely to coarsely crenate-serrate, often ciliate, thin, sparingly strigillose or nearly glabrous above, hirsutulous

beneath on the nerves and veins, the cystoliths linear and fusiform above, obscure beneath; plants monoecious or dioecious; staminate flowers in a few-flowered sessile cluster at base of pistillate cymes or a few scattered among pistillate flowers; pistillate inflorescence cymose-paniculate, up to 5 cm long, densely flowered, the branches slender; achenes less than 0.5 mm long.

DISTRIBUTION: Mexico, Central America, and West Indies to Peru and Venezuela, and perhaps to eastern Brazil; in South America at low elevations.

VENEZUELA.

FEDERAL DISTRICT: Caracas, *Gollmer* in 1853 (B).

LARA: Palmasola, *Pittier* 6379 (B, US).

MÉRIDA: La Asulita, *Reed* 706 (US).

COLOMBIA.

EL VALLE: Cisneros, *Killip* 11440 (G, Ph, US, Y). Buenaventura, *Triana* 876 (HNC, K, P).

EL CAUCA: El Tambo, *Sneidern* 995 (S).

NARIÑO: La Cruz, *André* K1672 (K, Y).

ECUADOR.

MANABI: El Recreo, *Eggers* 15022 (B, F, K, P, Y).

GUAYAS: Terecita, *Stevens* 59 (US). Balao, *Eggers* 14120 (B, US). Naranjal, *André* 2508 (K).

PICHINCHA: Santo Domingo, *Sodiro* 153/36 (B).

NAPO-PASTAZA: Tena, *Mexia* 7215 (US).

PERU.

SAN MARTÍN: Tarapoto, *Spruce* 4455 (B, BM, Brux, Gen, K, P, V, Y). San Roque, *L. Williams* 6957 (F, US), 7695 (F, US).

The species of this immediate relationship, *P. acuminata*, *P. involucrata*, *P. spruceana*, and *P. pubescens*, are not separable by well-defined characters. *Pilea acuminata* has long-petioled, acuminate, sharply toothed leaves; in *P. involucrata* the leaves are obovate and shallowly toothed; in *P. spruceana* oblong and shallowly toothed; and in *P. pubescens* predominantly broad-ovate. The foliar cystoliths of *P. acuminata* and *P. pubescens* are similar; in *P. involucrata* they usually are wanting from the upper surface except at the margin; in *P. spruceana* they are much smaller and much more numerous than in the three other species.

Pilea pubescens as here considered is perhaps an aggregate species, the specimens cited showing considerable variation. As the species is common outside of the Andean area, final treatment of the complex should await a broader study. The Andean material seems to represent three forms, of which typical *P. pubescens* is best shown by Spruce's no. 4455. The Venezuelan specimens have very broad leaves, which are essentially glabrous above. The Ecuadorean specimens have smaller leaves and are more densely pubescent in all parts.

103. Pilea hyalina Fenzl, Denkschr. Akad. Wiss. Math. Naturw. (Wien) **1**: 256. 1850.

Urtica arvensis Poepp.: Fenzl, Denkschr. Akad. Wiss. Math. Naturw. (Wien) **1**: 256. 1850, as synonym.

Pilea hyalina var. *longipes* (Mart.) Miquel in Mart. Fl. Bras. **4**[1]: 201. 1853.

Slender erect annual, 10 to 30 cm high, with a short rootstock and numerous fibrous rootlets, the stem pellucid; leaves rhombic-elliptic or ovate, 1 to 6 cm long, 0.8 to 4.5 cm wide, acute at apex, cuneate at base, coarsely serrate, thin-membranous, glabrous or sparsely hyaline-strigillose above, the petiole slender, usually with a few hyaline hairs, the cystoliths linear, faint; plants monoecious, the inflorescences androgynous, cymose-paniculate; achenes suborbicular, less than 0.5 mm long.

DISTRIBUTION: Mexico and Central America to Chile, Brazil, and Argentina, up to 1,500 meters altitude, the type from Rio de Janeiro, collected by Schüch.

VENEZUELA.

FEDERAL DISTRICT: Caracas, *Gollmer* in 1853 (B).

ARAGUA: Colonia Tovar, *Fendler* 1245 (K), 1826 (K). Ocumare Valley, *Pittier* 12166 (B, Gen, US).

COLOMBIA.

MAGDALENA: Santa Marta, *H. H. Smith* 1447 (B, F, Gen, Ph, US, Y), 1448 (B, F, Ph, US, Y).

NORTE DE SANTANDER: Chinácota, *Killip & Smith* 20804 (G, US).

TOLIMA: Quindío Trail, *Triana* 878 (HNC, P).

ANTIOQUIA: Medellín, *Archer* 895 (US). Fredonia, *Toro* 1077 (Y).

EL VALLE: Cisneros, *Killip* 11457 (US).

ECUADOR.

GUAYAS: Bucay, *Hitchcock* 20404 (US).

CHIMBORAZO: Pallatanga, *Sodiro* 153/31 (B).

PERU: *Mathews* 2032 (K); *Gay* (P); *Ruiz & Pavón* (Ma).

AMAZONAS: Moyobamba, *Mathews* 1555 (K).

SAN MARTÍN: San Roque, *L. Williams* 7149 (F, US).

HUÁNUCO: Cochero, *Poeppig* 1539 ("*Urtica arvensis* Poepp.," Gen).

JUNÍN: La Merced, *Killip & Smith* 23593 (US). San Ramón, *Killip & Smith* 24676 (US, Y). Yapas, Pichis Trail, *Killip & Smith* 25580 (US).

AYACUCHO: Aina, *Killip & Smith* 22746 (F, US, Y).

BOLIVIA.

LA PAZ: Yungas, *Bang* 2126 (B, BM, US, Y); *Rusby* 2561 (Y). Tipuani, *Buchtien* 5390 (B, US, Y), 7261 (B, US).

CHILE: Cordillera de San Fernando, *Meyen* (B).

This is a well-marked species, the numerous specimens examined showing little variation. In a few specimens the characteristic hyaline hairs are lacking.

104. Pilea arguta (H. B. K.) Wedd. Ann. Sci. Nat. III. Bot. **18**: 218. 1852. *Urtica arguta* H. B. K. Nov. Gen. & Sp. **2**: 39. 1817.

Straggling, somewhat shrubby herb, the stem much branched, the branches hirsute or nearly glabrous, densely leafy; leaves narrowly lanceolate to ovate-lanceolate, 1.5 to 5 cm long, 0.5 to 2 cm wide, acuminate at apex, glabrous above, sparsely pilosulous on nerves beneath, rarely glabrous throughout, often alternate on branches, the cystoliths punctiform above, with usually a few linear ones between nerves, all linear and conspicuous beneath; plants dioecious, the staminate and pistillate flowers in similar, few-flowered, sessile or subsessile clusters scarcely 5 mm long; achenes ovate, about 0.7 mm long.

DISTRIBUTION: Venezuela (?); southern Colombia and northern Ecuador, at 2,800 to 3,000 meters altitude, the type said to have been collected at Nueva Valencia, Carabobo, Venezuela.

VENEZUELA OR COLOMBIA: *Humboldt & Bonpland* (B, BW, P, type).

COLOMBIA.

EL CAUCA: Paletará, *Pennell* 7011 (US). Mount Puracé, *Killip* 6772 (G, US).

NARIÑO: Pasto, *André* 2997 (K). Tabano, *André* K1681 (K). Tuquerres, *Karsten* (V).

ECUADOR: "Andes Quitenses," *Hall* in 1833 (B).

CARCHÍ: Ibarra, *Hitchcock* 20790 (G, US), 20803 (G, US).

PICHINCHA: Mount Pichincha, *Jameson* 838 (BM, US); *Sodiro* 153/52 (B), 153/52b (B); *Benoist* 3257 (P).

The plant which I collected on Mount Puracé was a dense mass of intertwined stems, with numerous short, very leafy branches, the whole about 1 meter high.

The specimens from southwestern Colombia and northern Ecuador cited above agree excellently with the type material at Paris and Berlin, which is without locality data but which the authors, in describing the species, say came from Nueva Valencia, "alt. 235 hex." [State of Carabobo, Venezuela]. I doubt very much that this plant of the highest mountains of southwestern Colombia and Ecuador occurs also in the coastal region of Venezuela at an altitude of only 570 meters, and am confident that there is an error in the Humboldt-Bonpland data.

105. Pilea fasciata Wedd. in DC. Prodr. 16[1]: 149. 1869.

Plant erect, robust, the stem densely and softly hirsute-tomentose with light-brown hairs; stipules ovate, 1.5 to 2 cm long, persistent; leaves ovate, 6 to 12 cm long, 4 to 7 cm wide, acuminate at apex, rounded at base, sharply and closely dentate-serrate nearly to base, triplinerved (lateral nerves reaching to upper third of the blade), pilosulous and strongly asperate-bullate above, appressed-hirsute on the nerves beneath, white-fasciate above, the cystoliths linear, radiate from the center of the areoles; plants dioecious; pistillate inflorescence subcorymbose, dichotomous, the peduncle 5 to 6 cm long slender; achenes ovate, about 1.5 mm long.

Distribution: Known positively only from the type locality, in northwestern Colombia.

Colombia.

El Chocó: Novita, alt. 170 meters, *Triana* 886 (BM, type, HNC).

The dense indument on the stem and the strongly asperate-bullate leaves at once distinguish this species from near relatives. André's 3816 probably belongs here, though the stem in much less densely pubescent. This specimen is intermediate between *P. fasciata* and *P. ophioderma*, but as the leaves are sharply dentate-serrate rather than crenate-serrate, it is probably better placed in *P. fasciata*. The locality given on the label is Mindo, which is in the Province of Pichincha, Ecuador.

105a. Pilea ophioderma Killip, sp. nov.

Herba dioica, caule crasso, quadrangulari; stipulae magnae, ovatae, subpersistentes; folia ovato-lanceolata, attenuato-acuminata, conferte crenato-serrata, trinervia, valde fasciato-reticulata, supra sparse hirsutula vel glabrescentia, subtus in nervis dense hirsutula, cystolithis obscuris; flores ♂ in panicula compacta subsessili, ♀ in panicula laxa dichotoma pedunculata.

Erect perennial herb. 50 cm high, or more; stem stout, quadrangular, about 6 mm thick, glabrous, deep purple when dry, smooth, without cystoliths; stipules ovate, 2.2 to 3 cm long, 1 to 1.5 cm wide, rounded at apex, narrowed at base, flabellate-nerved, reddish brown, subpersistent; leaves ovate-lanceolate, 12 to 20 cm long, 6 to 10 cm wide, attenuate-acuminate at apex, rounded and subemarginate at base, closely crenate-serrate to base, trinerved (lateral nerves extending to the apex of the blade), reticulate-veined (veins impressed above, the leaf surface slightly darker along the veins than in the areoles, hence the reticulation very prominent), smooth, sparingly hirsutulous or glabrescent above, densely subappressed-hirsutulous on the nerves beneath, the cystoliths faint, fusiform above, punctiform beneath; plants dioecious; staminate flowers short-pediceled in few-flowered clusters borne in a subsessile, compact panicle in the upper axils, the perianth subglobose, about 1.5 mm wide, the lobes not mucronulate; pistillate flowers in sessile clusters, forming a loose dichotomous panicle up to 6 cm long (including a peduncle half as long), the bractlets ovate-lanceolate, about 5 mm long and 2.5 mm wide, subpersistent, the perianth segments ovate, nearly 1 mm long, subequal.

Type in the U. S. National Herbarium, no. 1,140,932, collected in mossy forest, on a spur of Cerro Tatamá, Department of Caldas, Colombia, altitude 2,800 to

3,300 meters (Western Cordillera), September 8–10, 1922, by F. W. Pennell (no. 10450).

This species differs from *P. fasciata* in having crenate-serrate rather than sharply dentate-serrate leaves, which, moreover, are smooth rather than strongly asperate-bullate. The stem is glabrous, whereas in typical *P. fasciata* it is densely hirsute.

The specific name is suggested by the mottling on the upper surface of the leaves.

106. Pilea pavonii Wedd. Ann. Sci. Nat. III. Bot. **18**: 219. 1852.

Urtica cymosa Pavón; Wedd. Ann. Sci. Nat. III. Bot. **18**: 219. 1852, as synonym.

Erect herb, 40 to 60 cm high, the stem stout, quadrangular, rufo-villosulous; leaves broadly ovate, 6 to 10 cm long, 4 to 6 cm wide, short-acuminate at apex, subrotund at base, crenate-serrate to base, triplinerved, subcoriaceous, finely appressed-pilosulous above, densely ferruginous-hirsute beneath, the petioles 1.5 to 3 cm long, the cystoliths minute, fusiform above, fusiform and punctiform beneath; plants monoecious, the inflorescences unisexual; staminate inflorescence borne in the uppermost axils on stout peduncles much longer than the petioles, compact, densely flowered, scorpioid, globose when young, subsecund, the pistillate inflorescence borne in the middle axils, cymose-paniculate, sessile or short-peduncled.

DISTRIBUTION: Central Peru.

PERU: *Pavón* (B, BM, Bo, Ma, P, type).

HUÁNUCO: Muña, alt. 2,000 meters, *Macbride* 4075 (F, US).

This is a striking species, the young plants easily recognized by the dense globose heads of flowers.

107. Pilea hirsuta (Pavón) Wedd. Ann. Sci. Nat. III. Bot. **18**: 220. 1852, in part.

Urtica hirsuta Pavón; Wedd. Ann. Sci. Nat. III. Bot. **18**: 220. 1852, as synonym.

Erect robust herb, the stem stout, ferruginous-villous; leaves ovate-elliptic, 7 to 15 cm long, 3 to 7 cm wide, coarsely serrate to base, triplinerved well above base, rugulose, ferruginous-hirsute on the nerves above and on the nerves and veins beneath, otherwise glabrous, the petioles about 2 cm long, densely ferruginous-hirsute, the cystoliths fusiform; plants dioecious, the staminate and pistillate inflorescence similar, paniculate, shorter than or slightly exceeding the adjacent petiole.

DISTRIBUTION: Probably central Peru.

PERU: *Ruiz* (B, Bo, type, US).

There is some confusion in regard to this species, partly because of Weddell's varying treatments. At the original place of publication of *Pilea hirsuta*, Weddell cites as synonyms "*Urtica hirsuta* et *U. punctata* Pav. mss." Following the description of the plant there appear these lines:

"Var α, foliis oblongo-ovatis triplinerviis supra glabratis.

Var β, foliis rotundato-ovatis trinerviis utrinque pubescentibus.

Crescit in Peruvia (Pavón).—v. s. in Herb. Webb. ex Herb. Pavón.

Toute la plante prend, en séchant, une teinte ferrugineuse."

In the Monographie des Urticées this is repeated, the manuscript name *U. punctata* Pavón not, however, being included. In the Prodromus the species is treated thus:

"*P. hirsuta* (Wedd. in Ann. Sc. Nat. 3^{e} sér. 18. p. 220. exclus. var. β; Monogr. p. 251)--------In Nova Granata (Pavón). *Urtica hirsuta* Pav. mscr--------

Varietas β in Monographia mea notata atque olim in herb. Webb. visa,

foliis minoribus rotundato-ovatis trinerviis (nec triplinerviis) et utrinque pubescentibus insignita, forsan huc non pertinet et denuo examinanda est."

The specimens at the Boissier and Berlin herbaria bearing the name *Urtica hirsuta* in either Ruiz's or Pavón's handwriting, which are matched by an unnamed one in the U. S. National Herbarium, agree with Weddell's description of var. α. The β element can not be definitely identified without examining the specimen in the Webb herbarium. There is a Ruiz and Pavón specimen at Berlin, labeled apparently in the writing of one of the collectors "*Urtica punctata* Ruiz." This does not answer well Weddell's description of β, for the leaves are triplinerved and not "utrinque pubescentibus." This seems to be *Pilea punctata* (H. B. K.) Wedd., though, it should be observed, the use of the name "*Urtica punctata*" by both "H. B. K." and Ruiz and Pavón was merely a coincidence.

The locality "Nova Granata," i. e. Colombia, given in the Prodromus was clearly an error, for there is no evidence that Weddell saw any Colombian specimens that he took to be this species. Perhaps this error is partly responsible for the reference [6] of Mayor's specimens from northwestern Colombia to *P. hirsuta*. I have not seen these specimens, but I suspect they belong to the related species *P. purpurea*.

108. Pilea purpurea Killip, Journ. Washington Acad. Sci. **13**: 357. 1923.

Erect herb, 40 to 60 cm high, the stem angulate, glabrous below, slightly pubescent above; leaves ovate or oblong, 8 to 12 cm long, 4 to 5 cm wide, short-acuminate at apex, rounded at base, finely serrate, 3-nerved (lateral nerves close to margin, extending to apex of blade), above dark green and glabrous, beneath paler, punctate, densely tomentulous on nerves and veins, the cystoliths linear and faint above, wanting beneath, the petioles 1.5 to 3 cm long, ferruginous-tomentose; plants monoecious; staminate cymes profusely dichotomous, densely tomentulous, borne in upper axils; pistillate cymes subsessile in lower axils, compact, barely 1 cm wide; achenes broadly ovate, 2 mm long.

DISTRIBUTION: Known only from the type locality, in northwestern Colombia.

COLOMBIA.

CALDAS: Cerro Tatamá, 2,700 meters, *Pennell* 10380 (US, type).

The foliage bears a general similarity to that of *P. mutisiana*, but the conspicuous white bracts subtending the purple staminate flowers are not evident in *P. mutisiana* nor has that species an indument.

As already noted in discussing *P. hirsuta*, possibly Mayor's specimens from northwestern Colombia belong here.

109. Pilea glaucophylla Killip, Contr. U. S. Nat. Herb. **26**: 392. 1936. PLATE 40.

DISTRIBUTION: Central Colombia.

COLOMBIA.

TOLIMA: Quebrada Honda, *André* K1669 (K, type). Tambo de Savanilla, *André* K1668 (K).

EXPLANATION OF PLATE 40—*Pilea glaucophylla*, the type specimen. One-half natural size.

110. Pilea salentana Killip, Contr. U. S. Nat. Herb. **26**: 393. 1936.

DISTRIBUTION: Known positively only from the Central Cordillera of Colombia, between 2,700 and 3,300 meters altitude.

COLOMBIA: "Andes Granadin., alt. 2,500 m.," *Triana* 890 (HNC, K, P). Quindío Trail, *Holton* in 1853 (Y).

TOLIMA: Between Ibagué and Mount Tolima, *Cuatrecasas* 2538 (Ma), 2590 (Ma).

CALDAS: Pinares, above Salento, *Pennell* 9354 (G, US, type). Magaña, Quindío Trail, *Killip & Hazen* 9447 (Ph, US).

[6] Mém. Soc. Sci. Neuchâtel **5**: 360. 1914.

The Triana specimen in the Herbario Nacional Colombiano bears the locality data given above. The other specimens of this collection are labeled "Barbacoas," perhaps in error.

111. Pilea castronis Killip, Contr. U. S. Nat. Herb. **26**: 394. 1936.

DISTRIBUTION: Known only from the type locality, in the Eastern Cordillera of Colombia, between 2,600 and 2,900 meters altitude.

COLOMBIA.

SANTANDER: Las Vegas, *Killip & Smith* 15949 (G, US, Y), 16019 (G, US, type, Y), 16126 (G, US, Y).

111a. Pilea cushiensis Killip, Field Mus. Bot. **13**[2]: 340. 1937.

Succulent herb, 1 to 1.5 meters high; stem sparsely rufo-hirsutulous toward the apex; stipules ovate, about 3 mm long, soon deciduous; leaves elliptic-ovate, 7 to 15 cm long, 3.5 to 6 cm wide, acuminate at apex, narrowed to a cordulate base, coarsely crenate-serrate, triplinerved, the lateral nerves extending to the upper quarter of the blade, the cystoliths linear, dense, faint beneath, the petioles up to 12 cm long; plants dioecious, the staminate inflorescences borne in most of the axils, paniculiform, about 3 cm long (not fully developed), rufo-hirsutulous, the perianth segments suborbicular.

DISTRIBUTION: Known only from the type locality, in central Peru.

PERU.

HUÁNUCO: Cushi, alt. 1,500 meters, *Macbride* 4826 (F, type, US).

In the key this species would come next to the Colombian *P. castronis*, being differentiated by the shape of the leaves and the cystolithic marking, and by having a more diffuse inflorescence.

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Pilea nummularifolia var. **klugii** Killip	513
Pilea ophioderma Killip	517
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The following list includes the numbered specimens studied:

ALLART, A.

185. microphylla.
484. dauciodora.

ANDRÉ, E.

442. microphylla.
879. mutisiana.
1053. latifolia.
1243. dauciodora.
1302. rhombea.
1895. argentea.
2082. mutisiana.
2453. serpyllacea.
2508. pubescens.
2517. microphylla.
2823. microphylla.
2890. microphylla.
2987. fallax.
2997. arguta.
3035. fallax.
3510. pteropodon.
3692. microphylla.
3816. fasciata?
4440. serpyllacea.
4674. involucrata.
K722. microphylla.
K723. microphylla.
K724. fallax.
K725. fallax.
K1487. mutsiana.
K1666. involucrata.
K1667. myriophylla.
K1668. glaucophylla.
K1669. glaucophylla.
K1670 in part. macrantha.
K1670 in part. tetrapoda.
K1671. tetrapoda.
K1672. pubescens.
K1673. alsinifolia.
K1674. fallax.
K1675. fallax.
K1676. fallax.
K1677. acuminata.
K1678. acuminata.
K1679. carnulosa.
K1680. gallowayana.
K1681. arguta.
K1682. goudotiana.
K2215. carnulosa.

ANTHONY, H. E., and TATE, G. H. H.

338. serpyllacea.
425. serpyllacea.

ARCHER, W. A.

1. microphylla.
2. microphylla.
690. microphylla.
770. microphylla.
895. hyalina.
1083. dauciodora.
1084. dauciodora.
1701. gallowayana.
1793. microphylla.
1977. trianaeana.
2081. imparifolia.
2129. daguensis.
2172. daguensis.
2184. gallowayana.
2189. gallowayana.
2190. imparifolia.

ARISTE JOSEPH, Brother

A322. lindeniana.
A329. rhombea.
A888. lindeniana.
A890. discolor.
A927. filicina.
B80. lindeniana.

BAILEY, L. H., and BAILEY, E. Z.

313. microphylla.
906. involucrata.

BANG, M.

687. strigosa.
894. multiflora.
1787. dauciodora.

1788. filipes.
1796. dauciodora.
2126. hyalina.
2374. cymbifolia.
2490. multiflora.

BENOIST, R.

2292. serpyllacea.
3257. arguta.
3583. serpyllacea.

BOLDINGH, I.

5648. microphylla.

BRIDGES, T.

741. elliptica.
742. elegans.

BROADWAY, W. E.

9. microphylla.
42. involucrata.
646. involucrata.

BUCHTIEN, O.

85. strigosa.
372. dauciodora.
383. sublobata.
657. multiflora.
794. sublobata.
795. strigosa.
2811. pauciserrata.
2813. dauciodora.
3110. picta.
3751. cymbifolia.
3752. cymbifolia.
3753. cymbifolia.
3754. rusbyi.
4524. picta.
4526. buchtienii.
5390. hyalina.
7261. hyalina.
7262. multiflora.
7263. multiflora.
8935. pauciserrata.
8937. dauciodora.
8938. strigosa.
8939. strigosa.
8940. picta.

CÁRDENAS, M.

1316. multiflora.
2074. multiflora.

CHARETIER, C.

65. microphylla.

CLAUDE JOSEPH, Brother

1862. elliptica.
2352. elliptica.
3994. elliptica.
4658. elegans.
5607. elegans.

COOK, O. F., and GILBERT, G. B.

262. serpyllacea.
1035. serpyllacea.
1095. nutans.

CORNELIO, Father

132. microphylla.

CRÜGER, H.

46. crugeriana.

CUATRECASAS, J.

2586. lindeniana.
2587. dauciodora.
2588. salentana.
2589. mutisiana.
2590. salentana.
3087. lindeniana.
3092. rhombea.
3093. lindeniana.

CUMING, H.

40. elliptica.

CURRAN, H. M., and HAMAN, M.

3. herniarioides.

DAWE, M. T.

265. lindeniana.
772. imparifolia.

DRYANDER, E.

94. microphylla.

EGGERS, H. F. A.

13178. mollis.
13445. rhombea.
14120. pubescens.
15022. pubescens.

ELIAS, Brother

564. microphylla.

ERNST, A.

458. rhombea.
1164. rhombea.
1705. mollis.
1706. crugeriana.

FENDLER, A.

1240. microphylla.
1241. mollis.
1244. involucrata.
1245. hyalina.
1246. dauciodora.
1247. fendleri.
1826. hyalina.
2429. urticella.

FIRMIN, G.

271. serpyllacea.
369. serpyllacea.
640. jamesoniana.

FUNCK, N.

145. mollis.

GARCÍA B., H.

4578. involucrata.
4652. serpyllacea.

GAY, C.

68. elliptica.
235. elliptica.
236. elegans.

GEHRIGER, W.

203. rhombea.
248. rhombea.
258. serpyllacea.
329. dauciodora.
592. fallax.

GUEVARA A., B.

218. serpyllacea.
252. rhombea.
344. acuminata.
F.1. fallax.

GUNCKEL, H.

68. elliptica.

HAENKE, T.

1731. nutans.
1860. macrocystolithica.
1870. haenkei.

HALL

5. flexuosa.
28. serpyllacea.

HAUGHT, O

1274. centradenioides.
1305. centradenioides.
1592. centradenioides.

HEINRICHS

32. serpyllacea.

HERIBERTO, Brother

342. microphylla.

HERRERA, F. L.

6. nutans.
51. serpyllacea.
2288. serpyllacea.
3065. serpyllacea.

HERZOG, T.

2305. cymbifolia.
2416. picta.

HITCHCOCK, A. S.

20404. hyalina.
20790. arguta.
20803. arguta.
21445. serpyllacea.
21825. hitchcockii.

HOLLERMEYER

511. elliptica.

HOLTON, I. F.

256. involucrata.
262. dauciodora.

HUBER, J.

1519. imparifolia.

JAHN, A.

595. rhombea.

JAMESON, W.

481. serpyllacea.
734. imparifolia.
745. jamesoniana.
789. flexuosa.
834. serratifolia.
838. arguta.

JULIO, Brother

332. picta.
357. picta.
462. strigosa.
466. picta.

KALBREYER, G.

531. lippioides.
691. hydrocotyliflora.
1023. alsinifolia.
1039. acuminata.

KILLIP, E. P.

5117. seemannii.
5439. microphylla.
5698. imparifolia.
5845. involucrata.
6673. puracensis.
6772. arguta.
6777. fallax.
6832. myriantha.
6888. serpyllacea.
7672. acuminata.
7678. scandens.
7703. pteropodon.
9772. mutisiana.
11440. pubescens.
11457. hyalina.
11550. daguensis.

KILLIP, E. P., and HAZEN, T. E.

8786. imparifolia.
9007. flexuosa.
9438. carnulosa.
9447. salentana.
9475. mutisiana.
9482. mutisiana.
10121. flexuosa.
10129. scandens.
11891. mutisiana.

KILLIP, E. P., and SMITH, A. C.

14353. microphylla.
14470. microphylla.
14690. herniarioides.
15541. rhombea.
15559. lippioides.
15949. castronis.
16019. castronis.
16020. vegasana.
16025. vegasana.
16043. vegasana.
16054. lippioides.
16082. vegasana.
16093. dauciodora.
16097. goudotiana.
16126. castronis.
16200. microphylla.
16258. microphylla.
16421. rhombea.
16560. latifolia.
16561. aff. smithii.
16584. rhombea.
16989. rhombea.
16990. smithii.
17014. alsinifolia.
17025. rhombea.
17090. rhombea.
17188. smithii.
18023. rhombea.
18284. smithii.
18797. smithii.
18808. carnulosa.
18830. dauciodora.
18849. rhombea.
18964. goudotiana.
18968. vegasana.
19021. aff. smithii.
19032. latifolia.
19097. alsinifolia.
19119. alsinifolia.
19138. goudotiana.
19164. goudotiana.
19201. goudotiana.
19370. acuminata.
19405. alsinifolia.
19457. alsinifolia.
19464. alsinifolia.
19847. dauciodora.
19969. losensis.
20188. alsinifolia.
20202. rhombea.
20207. dauciodora.
20370. losensis.
20390. dauciodora.
20403. rhombea.
20669. dauciodora.
20693. dauciodora.
20800. involucrata.
20804. hyalina.
21601. serpyllacea.
22357. diversifolia.
22439. dauciodora.
22746. hyalina.
23593. hyalina.

24073. microphylla.
24160. dauciodora.
24274. nutans.
24281. foliosa.
24334. serpyllacea.
24400. foliosa.
24408. dauciodora.
24457. macbridei.
24676. hyalina.
25329. microphylla.
25580. hyalina.
25638. costata.
25775. multiflora.
25789. nutans.
25795. strigosa.
25801. multiflora.
25826. poeppigiana.
25876. pichisana.
25885. diversifolia.
25895. nutans.
25902. poeppigiana.
25913. multiflora.
25929. multiflora.
26023. submissa.
26032. marginata.
26038. imparifolia.
27500. microphylla.
28429. bassleriana.
28467. bassleriana.
28471. bassleriana.
28835. strigosa.
28843. strigosa.
28993. bassleriana.
29145. bassleriana.
29196. bassleriana.
29308. imparifolia.
29515. imparifolia.
29572. imparifolia.

KLUG, G.

1672. umbriana.
1931. imparifolia.
2870. bassleriana.
3186. submissa.
3719. microphylla.

KUNTZE, O.

1328. microphylla.
1670. mollis.

LAWRANCE, A. E.

652. centradenioides.

LECHLER, W.

409. elliptica.

LEHMANN, F. C.

4475. cuprea.
5411. serpyllacea.
BT1258. discolor.
K332. fallax.
K333. involucrata.

LINDEN, J. J.

799. lindeniana.
1206. mutisiana.

MACBRIDE, J. F.

3126. minutiflora.
3289. dombeyana.
3512. serpyllacea.
3650. ramosissima.
3690. microphylla
3770. poeppigiana.
3868. serpyllacea.
3984. diversifolia.
4075. pavonii.
4087. serpyllacea.
4117. dauciodora.
4395. nerteroides.
4400. delicatula.
5086. marginata.
5179. macbridei.
5201. verrucosa.
5822. citriodora.
5910. lamioides.

MACBRIDE, J. F., and FEATHERSTONE, W.

447. serpyllacea

MANDON, G.

1005. serpyllacea.
1103 in part. dauciodora.
1103 in part. filipes.
1104 multiflora.
1124. dauciodora.

MATHEWS, A.

1555. hyalina.
2032. hyalina.
3101. microphylla.

MEXÍA, Y.

6355. bassleriana
6359. submissa.
6360. bassleriana.
6365. imparifolia.
6881. trichosanthes.
7177. hitchcockii.
7178. trichosanthes.
7211. trichosanthes.
7215. pubescens.
7307. submissa.
7592. myriantha.
8476. pteropodon.

MILLE, L.

20. microphylla.
93. microphylla.

MORITZ, J.

366. mollis.
790. fendleri.
1293. lindeniana.
1294. rhombea.

MUTIS, J. C.

1900. lindeniana.
1908. aenea.
1922. involucrata.
1929. mutisiana.

PACHANO, A.

3. serpyllacea.

PEARCE, R.

118. serpyllacea.
284. spruceana.

PENNELL, F. W.

1738. herniarioides.
1863. lindeniana.
2278. lindeniana.
2731. involucrata.
3164. mutisiana.
3167. mutisiana.
4416. pittieri.
4502. trianaeana.
4541. imparifolia.
6944. fallax.
7011. arguta.
7559. fallax.
8869. mutisiana.
9299. mutisiana.
9336. fallax.
9354. salentana.
9401. fallax.
10325. tatamensis.
10326. pennellii.
10374. obetiaefolia.
10376. fallax.
10377. fallax.
10378. tatamensis.
10379. dauciodora.
10380. purpurea.
10450. ophioderma.
10476. cuprea.
12608. elliptica.
12653. elliptica.
13657. serpyllacea.
14013. multiflora.
14049. nutans.
14751. lamioides.

PENNELL, F. W., and KILLIP, E. P.

5878. gallowayana.
7336. fallax.
7373. rojasiana.
7375. fallax.

PENNELL, F. W., KILLIP, E. P., and HAZEN, T. E.

11887. involucrata.

PÉREZ A., E.

351. microphylla.
2374. involucrata.

PHILIPPI, R. A.

28. elliptica.

PITTIER, H.

1216. lippioides.
6379. pubescens.
7145. nummularifolia.
9551. microphylla.
9585. mollis.
10448. rhombea.
11120. dauciodora.
11127. rhombea.
11863. involucrata.
11972. microphylla.
12166. hyalina.

12417. involucrata.
13898. crugeriana.
13984. losensis.

POEPPIG, E. F.

1032 in part. ceratocalyx.
1032 in part. poeppigiana.
1058. marginata.
1383. fendleri.
1539. hyalina.
1539B. poeppigiana.
1552 in part. fendleri.
1552 in part. strigosa.
1565. nutans.
2088. marginata.
3045. marginata.
3046. ceratocalyx.

RAIMONDI, A.

285. lamioides.
2209. serpyllacea.
2398. citriodora.
2800. dauciodora.
5639. serpyllacea.
7092. ramosissima.
9290. nutans.
9649. nutans.

REED, E. C.

185. microphylla.
706. pubescens.
780. lindeniana.
792. lindeniana.
796. lindeniana.

RIMBACH, A.

136. serpyllacea.

RODRIGUEZ, S.

36. lindeniana.

ROSE, J. N.

21946. nummularifolia.

RUIZ H.

4677. diversifolia.

RUSBY, H. H.

1478. multiflora.
1479. filipes.
1480. cymbifolia.
1481. cymbifolia.
1482. cymbifolia.
1483. dauciodora.
1484. sublobata.
1485. strigosa.
1756. filipes.
1774. rusbyi.
2561. hyalina.

RUSBY, H. H., and PENNELL, F. W.

458. microphylla.
553. rhombea.
654. argentea.
794. dauciodora.
938. argentea.

SCHLIM, L.

701. latifolia.
1134. nutans.

SCHUNKE, C.

498. foliosa.
678. foliosa.
992. foliosa.

SEEMANN, B. C.

1099. centradenioides.

SEIFRIZ, W.

317. microphylla.
541a. microphylla.

SMITH, H. H.

1223. fendleri.
1430. apiculata.
1445. involucrata.
1446. rhombifolia.
1447. hyalina.
1448. hyalina.
1460. microphylla.

SNEIDERN, K.

413. gallowayana.
414. fallax.
707. pteropodon.
772. daguensis.
773. gallowayana.
788. pteropodon.
862. pteropodon.

863. pteropodon.
881. scandens.
964. fallax.
965. fallax.
968. rhombea.
975. gallowayana.
993. gallowayana.
1025. bassleriana.
1210. puracensis.
1396. rojasiana.
1614. bassleriana.

SODIRO, A.

153/17. microphylla.
153/18. serpyllacea.
153/19. serpyllacea.
153/20. serpyllacea.
153/23. jamesoniana.
153/23b. jamesoniana.
153/23c. serratifolia.
153/24. attenuata.
153/26. flexuosa.
153/27c. myriantha.
153/29. attenuata.
153/31. hyalina.
153/36. pubescens.
153/52. arguta.
153/52b. arguta.

SPRUCE, R.

4028. microphylla.
4155. submissa.
4376. spruceana.
4434. imparifolia.
4455. pubescens.
6047. jamesoniana.
6106 in part. fallax.
6106 in part. jamesoniana.
6107. fallax.

STEINBACH, J.

5028. nutans.
5709. multiflora.
5812. multiflora.
8542. multiflora.
8890. nutans.
8974. dauciodora.
9153. dauciodora.

STEVENS, F. L.

59. pubescens.

STÜBEL, A.

90e. involucrata.
362b. fallax.
432. serpyllacea.

TATE, G. H. H.

184. sublobata.
187. tatei.
188. tatei.
190. tatei.
351. microphylla.
585. tungurahuae.
643. serpyllacea.
665. tetrapoda.

TESSMANN, G.

3721. imparifolia.
4603. bassleriana.
4667. bassleriana.
4742. microphylla.

TORO, R. A.

624. involucrata.
885. antioquiensis.
949. tatamensis.
969. dauciodora.
1049. dauciodora.
1077. hyalina.

TRIANA, J.

236. lindeniana.
344. mutisiana.
345. carnulosa.
492. nutans.
876. pubescens
877. lindeniana.
878. hyalina.
886. fasciata
887. centradenioides.
888. seemannii.
889. daguensis.
890. salentana.
891. gallowayana.
892. pteropodon.
898. serpyllacea.
899. serpyllacea.

TROLL, C.

3737. lindeniana.
3738. goudotiana.

ULE, E.

6508. marginata.
6588. subamplexicaulis.
6657 microphylla.
6843. spruceana.
6844. poeppigiana.

WEBERBAUER, A.

158. serpyllacea.
575. minutiflora.
753. dauciodora.
1594. lamioides.
1776a. citriodora.
2022. weberbaueri.
2023. pusilla.
2027. minutiflora.
3872. nitida.
4054. serpyllacea.
4307. punctata.
4387. suffruticosa.
4892. serpyllacea
5244. nitida.
6812. multiflora.

WEDDELL, H. A.

4184. multiflora.
4561. dauciodora.

WERDERMANN, E.

1954. elliptica.

WEST, J.

8035. nutans.

WILLIAMS, L.

1917. nummularifolia.
4082. microphylla.
6071. microphylla.
6662. microphylla.
6957. pubescens.
7149. hyalina.
7233. microphylla.
7425. subamplexicaulis.
7695. pubescens.

WILLIAMS, R. S.

199. spruceana.

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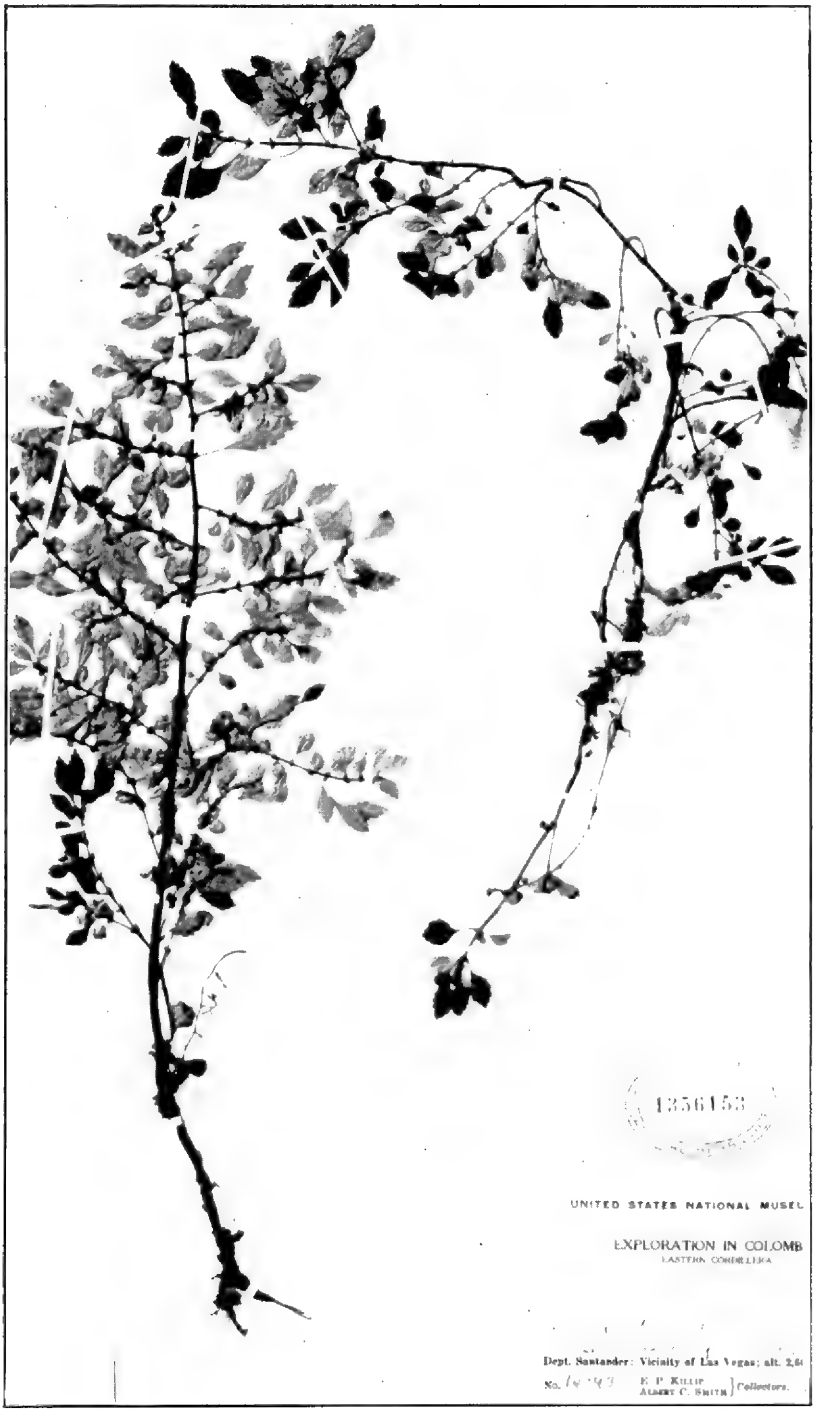

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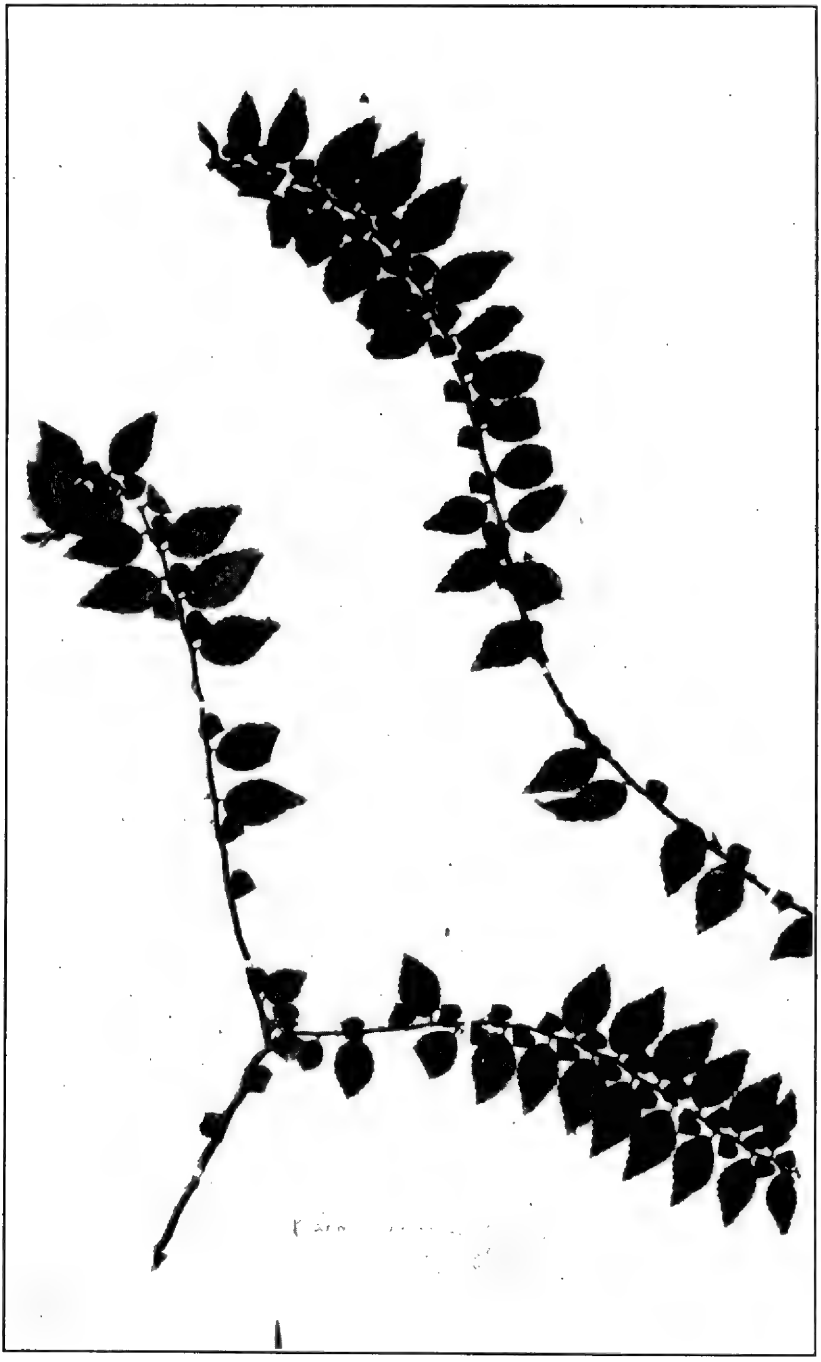

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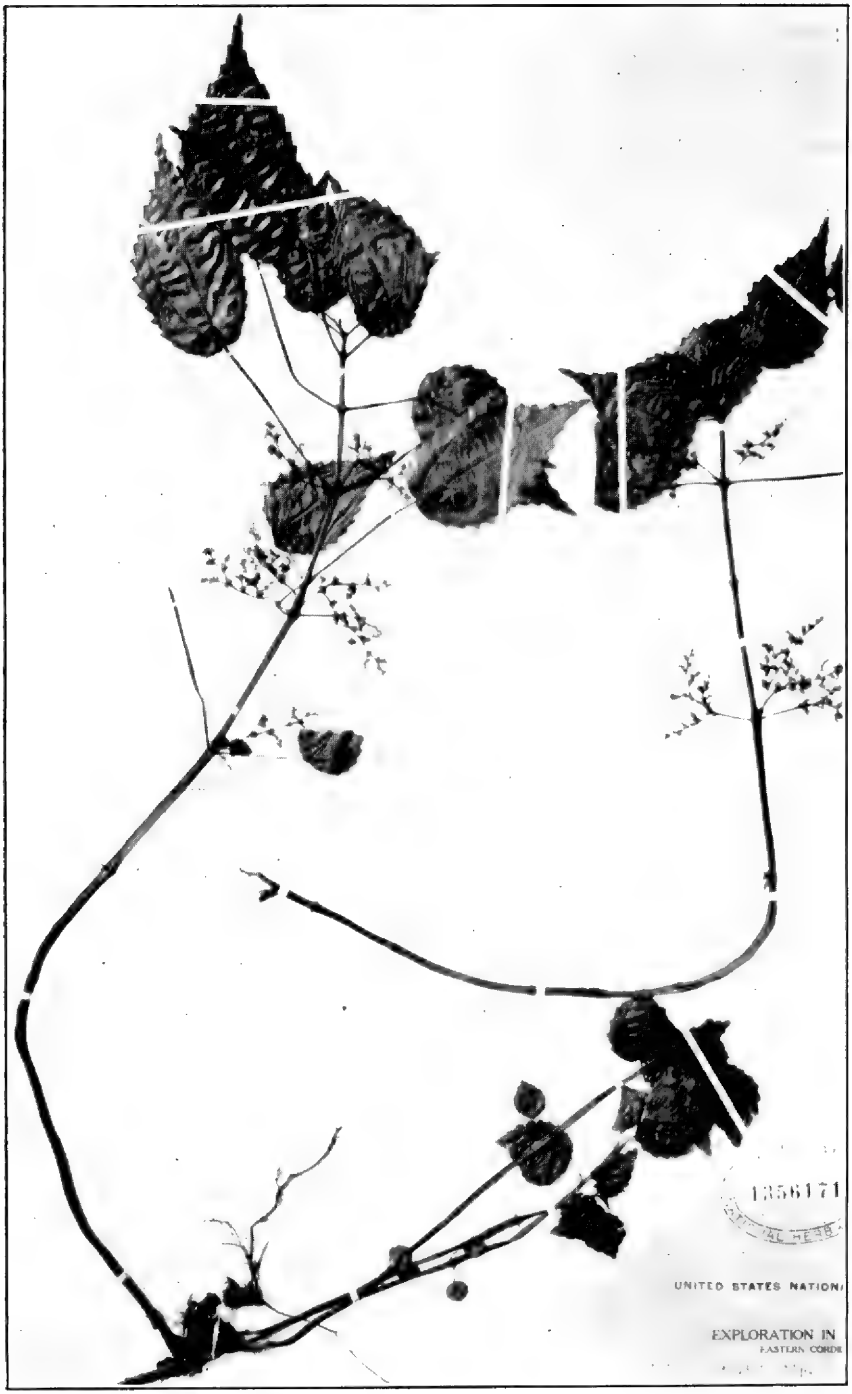

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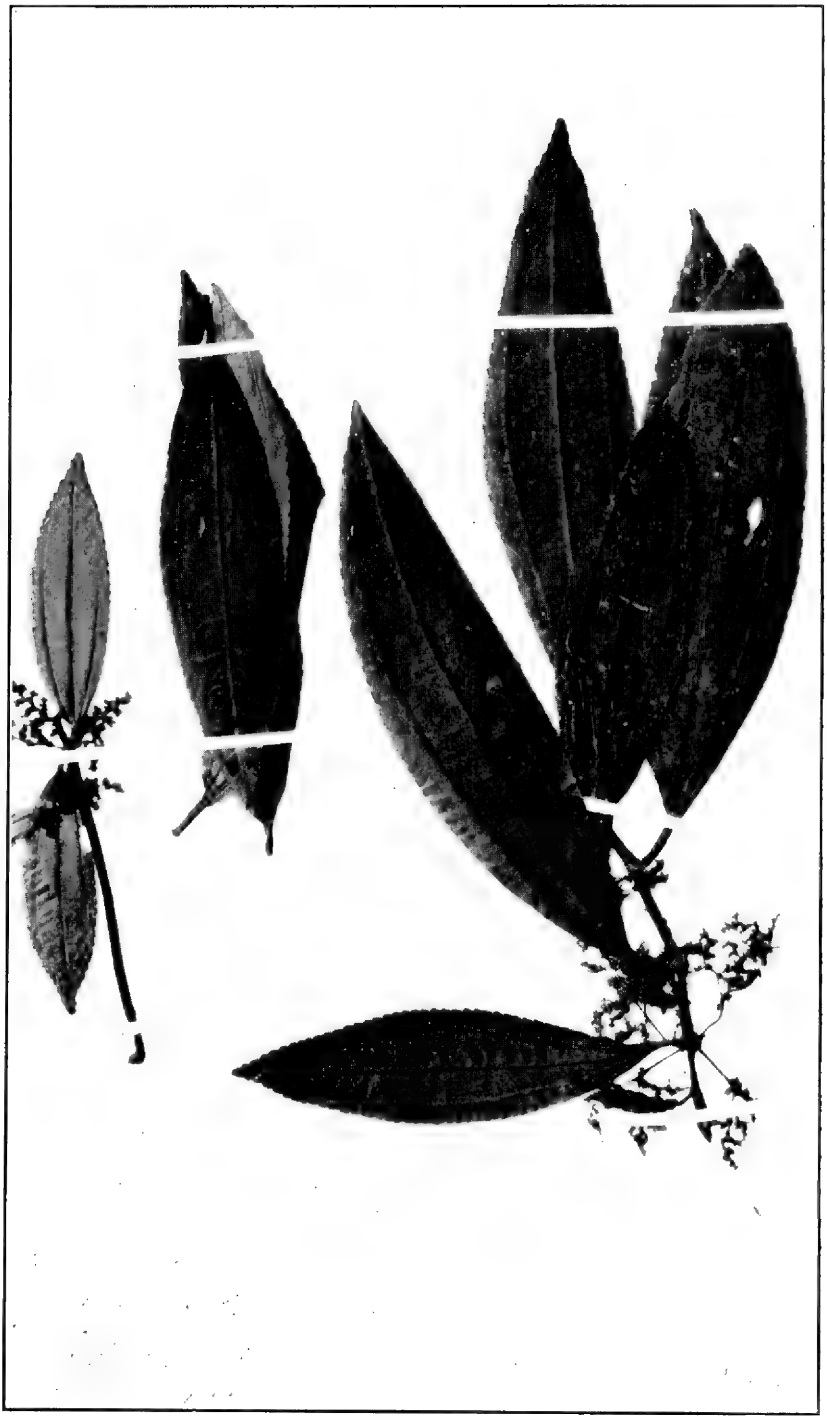

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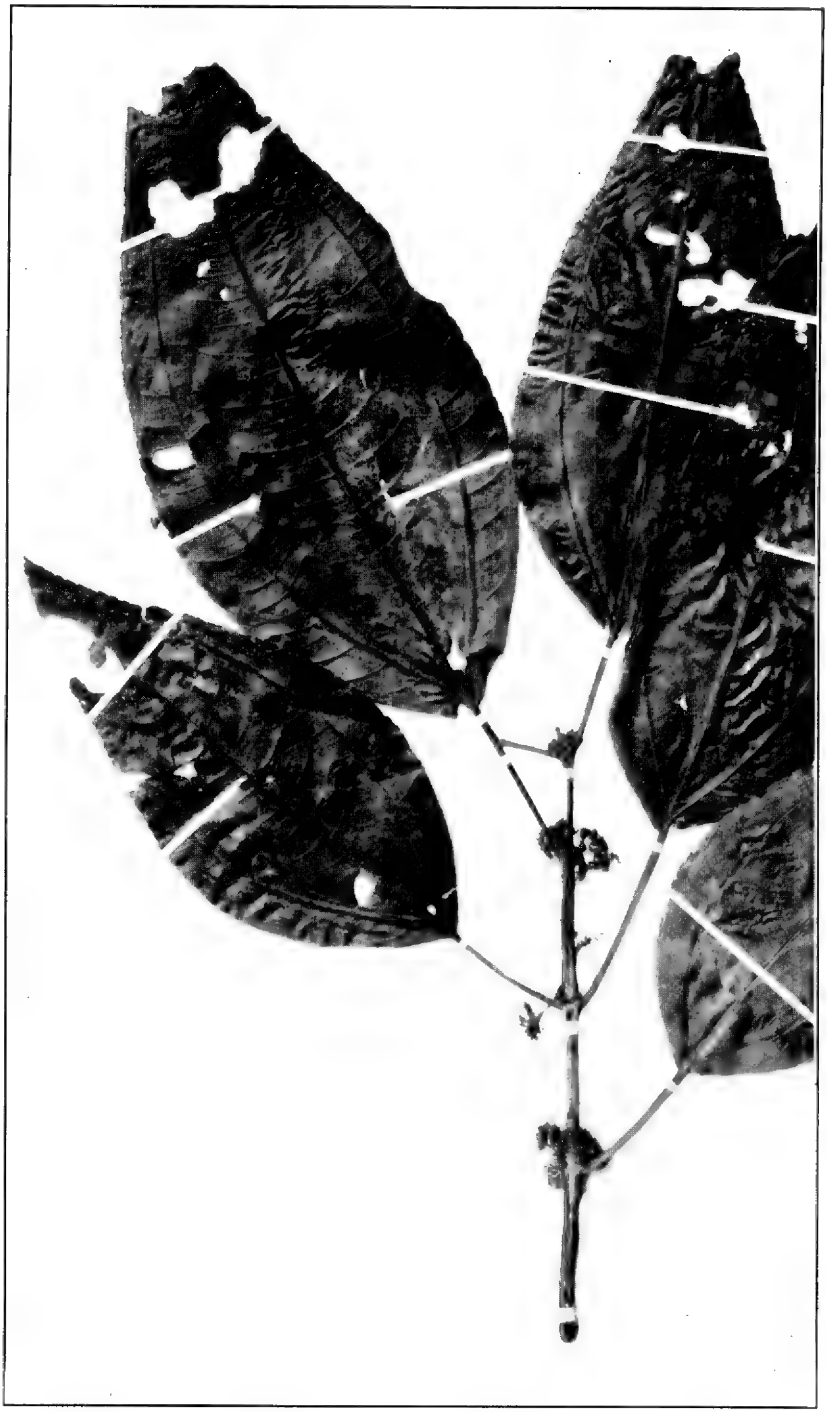

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